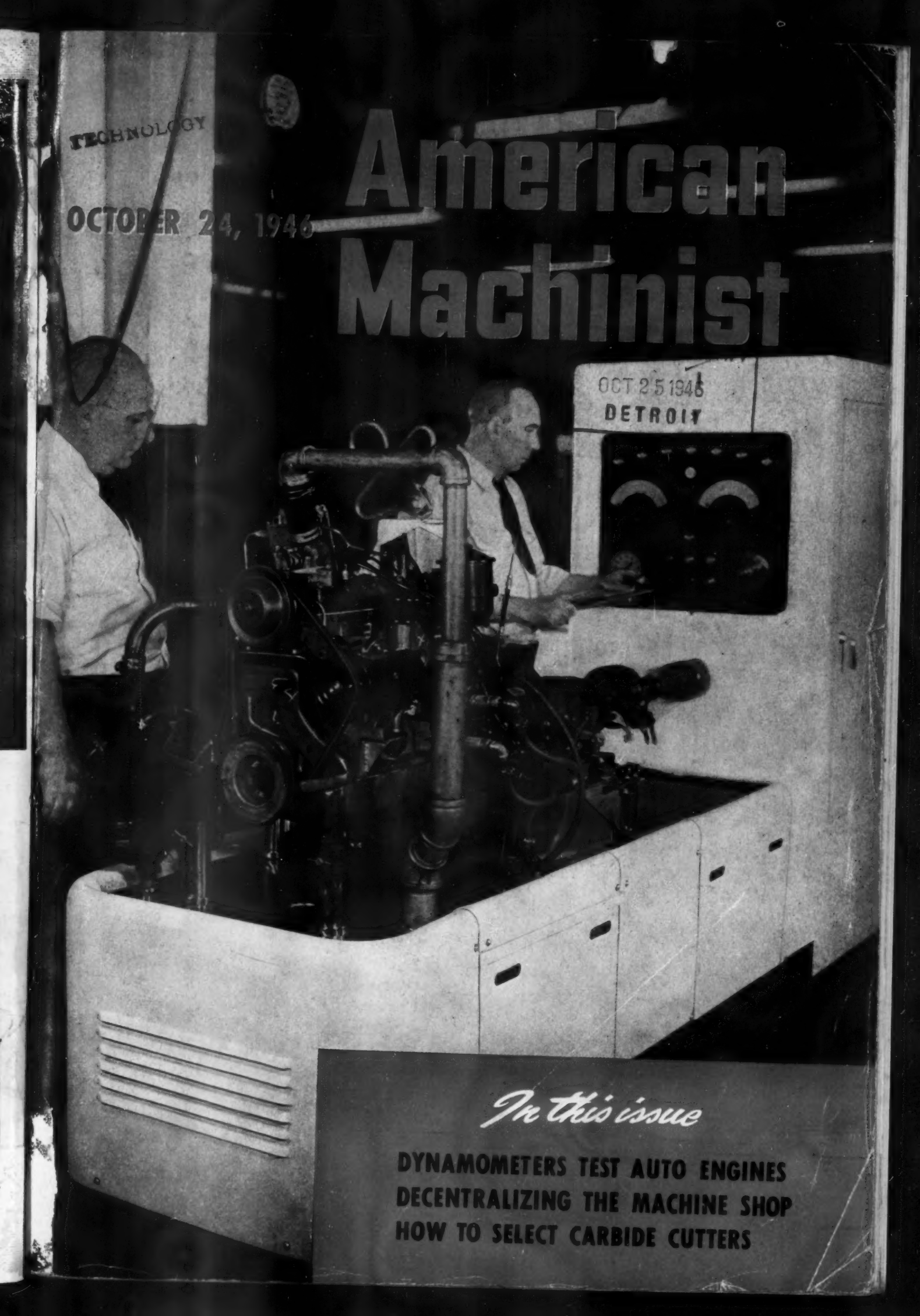
TECHNOLOGY

OCTOBER 24, 1946

American Machinist

OCT 25 1946
DETROIT



In this issue

DYNAMOMETERS TEST AUTO ENGINES
DECENTRALIZING THE MACHINE SHOP
HOW TO SELECT CARBIDE CUTTERS

It's the Heald No. 75-A Internal, with new anti-friction table ways . . . ready to cut your small-lot grinding costs

EFFICIENCY in small-lot grinding jobs largely depends on ease of operation. And that's one of the outstanding features of the Heald No. 75-A Internal, equipped with new anti-friction table ways for faster, effortless grinding.

Table action on this simple, manually operated Heald Internal is remarkably smooth and easy . . . a mere touch on the handwheel operates the table, hence greatly reduces operator fatigue. Ways are prelubricated for life . . . give instantaneous table response . . . put finger-control precision into small-lot operations.

That's why the Heald No. 75-A Internal is ideal for your tool room—with ample capacity for the general run of face, chamfer and internal grinding. Use it for work up to 2" in length, with either straight or tapered holes, such as gears, pinions, bushings, and rings. You'll find that it Increases the range of your work . . . and brings your costs down.

If you'd like to know more about Precision Finishing Tool Room Work and Small-Lots, we'll be glad to send you our latest 40-page bulletin on the subject. THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

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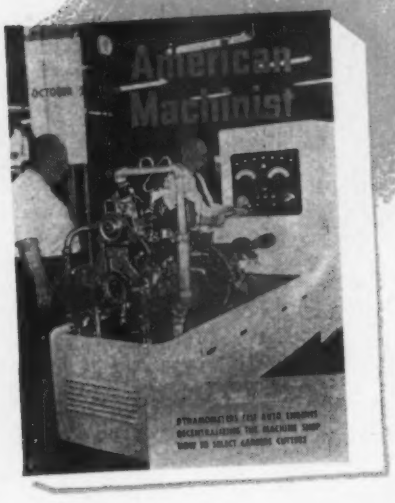

Chips and QUIPS

Master Inspector . . . Dodge is using electronic dynamometer units for production-testing engines. The units have an important bearing on quality control. The equipment is Kodachromed on our cover, described in an article.

Survey Premiums . . . As many readers know, we have for the past year been asking a different but truly typical group of subscribers to judge the content of each issue, and to pick the best Practical Idea. The Aug. 15 survey indicated approval of Wallace C. Mills and his article on forming thin metal; an earlier one did the same for the Kearney & Trecker data on carbide tools. As a result, we present in this issue generous second helpings of both, Mr. Mills discussing beading and Messrs. Stevens and Schmidt describing selection of carbide cutters. We hold to the old-fashioned idea that the customer should have what he wants.

One or Many? . . . We've heard arguments pro and con on the idea of decentralizing a machine shop. Should it be kept all in one place, or be broken into a series of shops, each spotted at the point where its products are used? Ben Hamilton discusses the problem. as RCA faced it during the war, and tells what was done about it.

Thank You Kindly . . . An engineer at Hamilton Watch reports our story on drilling and tapping small holes was well enough done so Hamilton requested its engineers to read it. What tickles us is that a good third of the data came from Hamilton in the first place . . . C. W. Hinman, who is an old-timer among writers on tool engineering, chuckles over a $25 check we sent because readers said his Practical Idea was the best in our June 20 issue, then titillates our vanity with, "I think you are doing a splendid job on all the recent issues . . . They are all very interesting . . ." And Wm. C. Carr, late of the armed forces, says: "Your magazine has been coming to me regularly and I have spent the past month looking over every issue. They have meant a great deal to me . . . I recommend the *American Machinist* with much enthusiasm." . . . And we thought all ex-GI's were spending their terminal leaves looking over the local blondes . . . with much enthusiasm.

Safety First . . . Safety is always the subject people need most to be reminded about and seem to want to hear least about We've presented two safety stories this year, both heavily cartooned (John Dope, Three Blind Mice) sort of like sugar-coating a needed cathartic. But this time we've got a safety story that you'll want to read—the experiences at Gisholt with a safety program that's easy to take.

Magnesium Addenda . . . Speaking of magnesium, one company is making a wheelbarrow and a canoe of the stuff. The barrow weighs 12 lb., so will be easy for South African and Indian natives to carry on their heads, as they're reportedly fond of doing.

Coming . . . Anderson Ashburn, our only redheaded associate editor, has recently been traveling the highways and byways on a light assignment, getting the lowdown on what metalworking learned about our lightest metal during the war. He's put it all into 16 hard-bitten pages to go in *A.M.* for Nov. 7 as the special report of our issue for the Metal Show. He'll also be putting together a Shop Equipment News section that is in reality a preview of the new things at the show . . . Other articles place emphasis on the subjects discussed at associated meetings; metals, welding, heat-treating, forming. . . . We've an article on resistance-welding stainless (the first of a series —this one on spot-welding). There's another on tools for drawing stainless, a description of the Westinghouse X-ray lab., hints on ordering heat-treatment, and a first-class discussion on how the metallurgist can save you headaches.

TEACHER OF SAFETY . . . "The story of safety at Gisholt is pretty much the story of John Wrage, says George H. Johnson, president. (See "Safety—from the Inside Out" in this issue). Wrage is an industrial accident himself . . . a very fortunate one for Gisholt. He set out to be a school teacher, learning the toolmaker's trade to put himself through Oshkosh (Wis.) State Teachers College, where he graduated with a B.S. degree in 1932.

After teaching psychology and allied subjects for nine years in Wisconsin public schools, he came to Madison in 1941 to do post-graduate work at the University of Wisconsin. He went to school days and paid the expenses of his family by working nights in the Gisholt toolroom. He got his Master's in 1942 and set out after a Doctor's degree, all the while with teaching as his goal. Then came the accident that changed his career. Gisholt had grown from 600 to 3400 workers, and accidents were increasing too. George Johnson wanted a safety director and he knew where to go for him. Wrage applied practical psychology to safety, with success.

JOHN WRAGE

PRODUCE CONIFLEX* GEARS FOR

1. Wider operating tolerances—allowing slight deflections in operation without dangerous concentration of the load at the ends of the teeth.
2. Smoother quieter operation—localization of tooth contact in Coniflex gears assures a good tooth bearing under operating loads.
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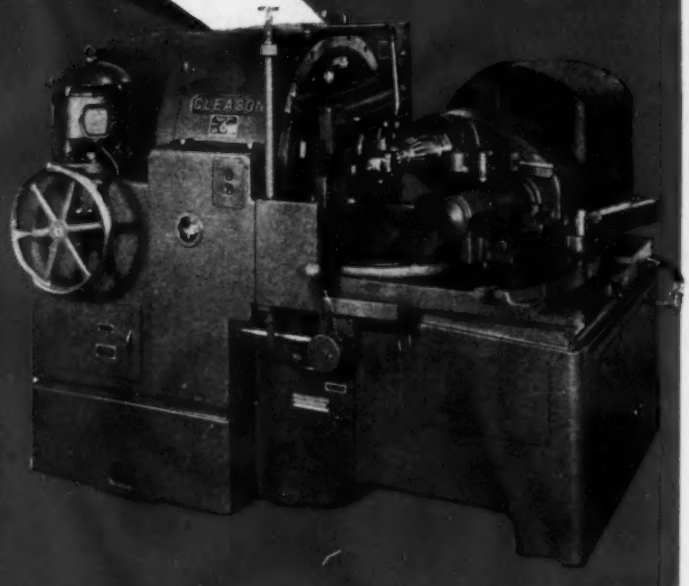
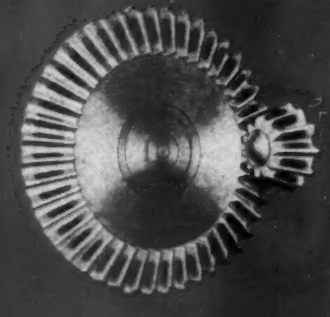
BEVEL GENERATOR

Write for information on this development to produce the latest in straight bevel gears...the Coniflex* gear...positive advance of the tool slides through cam action at each end of the cutting stroke relieves the ends of the gear teeth resulting in a localized tooth bearing.





***CONIFLEX—THE BEVEL GEAR WITH LOCALIZED TOOTH BEARING**

GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over 80 Years

CINCINNATI

Three

In the illustration above the new CINCINNATI 16" Vertical Hydro-Tel Die-Sinker is reproducing a single throw crankshaft die from a master.

THE CINCINNATI

MILLING MACHINES

-way saving in Die-Sinking ON THE NEW CINCINNATI 16" VERTICAL HYDRO-TEL DIE-SINKER

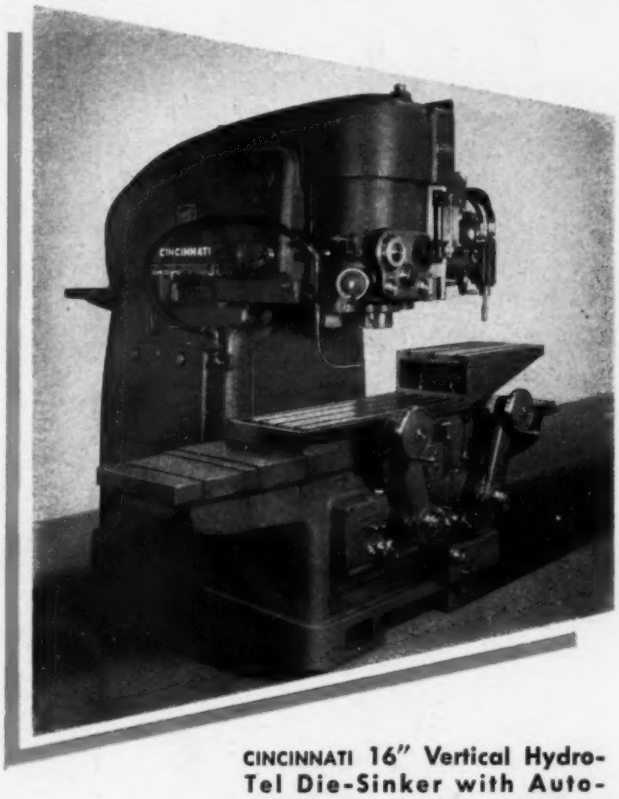
Small- to medium-sized dies and molds can be produced at a three-way saving on the new CINCINNATI 16" Vertical Hydro-Tel Die-Sinking Machine.

1) SAVES OPERATOR'S ENERGY. Convenient grouping of controls, with effortless hand Servo positioning of the table and cross slide, enables operator to easily and smoothly follow layout lines. And when templates or masters are available, the 16" Hydro-Tel *automatically* scans the impression, saving operator energy still further and relieving him of attentive alertness while the cut progresses.

2) SAVES TIME IN ROUGHING THE DIE IMPRESSION. Because of the exceptionally rugged construction of the 16" Vertical Hydro-Tel, heavy cuts can be taken, and the die impression is roughed out in half the time you might expect.

3) SAVES TIME IN HAND FINISHING. The depth control unit on these machines is exceptionally sensitive and accurate, resulting in accurate die impressions which require a minimum of hand finishing.

It will pay you to consider further the many advantages of the CINCINNATI 16" Vertical Hydro-Tel Die-Sinker for milling dies and molds of various shapes. Write for catalog M-1497. A brief description is given in Sweet's Catalog File.



CINCINNATI 16" Vertical Hydro-Tel Die-Sinker with Automatic Depth Control Unit

CINCINNATI 16" Vertical Hydro-Tel Milling Machines are available in three styles: 1) for Die-Sinking; 2) for General Purpose Milling; 3) for Automatic 360° Profiling.

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Extreme

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Precision

The extreme precision required in the manufacture of radio tube components demands exacting control. The most modern inspection methods must be used.

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BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS
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SMALL THREADED W

PRECISION CU

...ON THE FI

● **GOVERNMENT SURPLUS MACHINE TOOLS:** We are licensed under the WAR ASSETS ADMINISTRATION to act as dealers in the disposal of Government Surplus Machinery. Those interested in obtaining such machinery should contact our Main Office, Springfield, Vt.; or our offices in Detroit, Mich. and Chicago, Ill.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR ALL

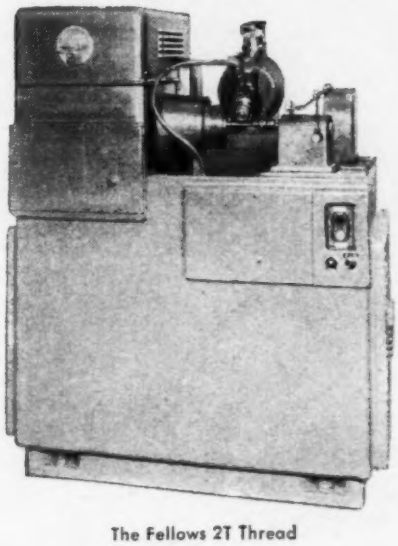
WORMS CUT FAST

FELLOWS 2T THREAD GENERATOR

A multitude of products for both home and industry . . . yes, even those just coming off the drafting boards . . . now require intricate, small fine-pitch worms — machined to the strictest tolerances for smooth operation.

This new Fellows machine . . . specifically designed for small parts (up to 2 inches in diameter and 2½ inch thread, on pieces to 8 inches length) is bound to cut costs! It provides precision machining of worms on a production basis. The machine can be arranged for cutting either right or left hand, single and multiple threads up to a maximum of 16 linear pitch.

Where precision is paramount and rapid production a cost factor, it will pay you to contact the Fellows Sales Engineer for further particulars or write direct: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit, Michigan — or 640 West Town Office Bldg., Chicago, Illinois.

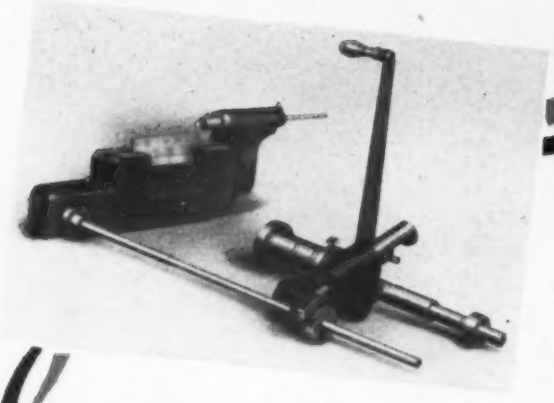


The Fellows 2T Thread Generator

Fellows

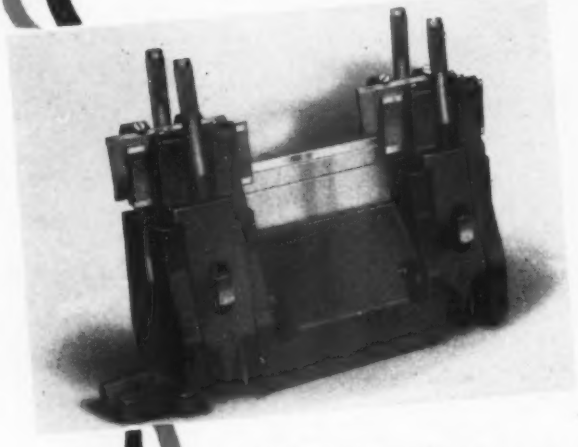
FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

HYDRAULIC GRINDING WHEEL PROFILE TRUING DEVICE for truing the grinding wheel to the desired shape for various types of form grinding. Cam controlled.

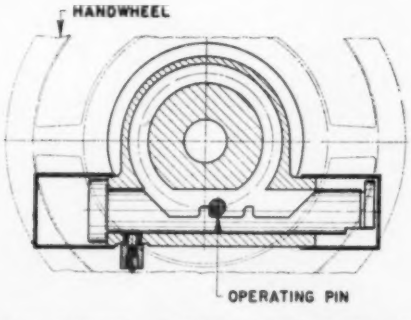


AUTOMATIC EJECTOR for infeed operations. Work is automatically ejected when infeed lever is returned to starting position.

● Changing the design of your product, or the introduction of a new one, may upset the method of producing centerless ground parts. When that happens, it calls for a thorough study of your centerless equipment to see what can be done to grind the new parts on your present machines. If your centerless grinders are CINCINNATI'S, the chances are you can purchase an attachment that will exactly fit your requirements. Illustrated are a few of the accessories and attachments available for CINCINNATI Centerless Grinders. Complete information on these and others may be obtained by writing for catalog G-456-3.



THRUFEED WORK REST for work which is ground by the thrufeed method. Several sizes available, depending upon width of wheels used and size of work ground.

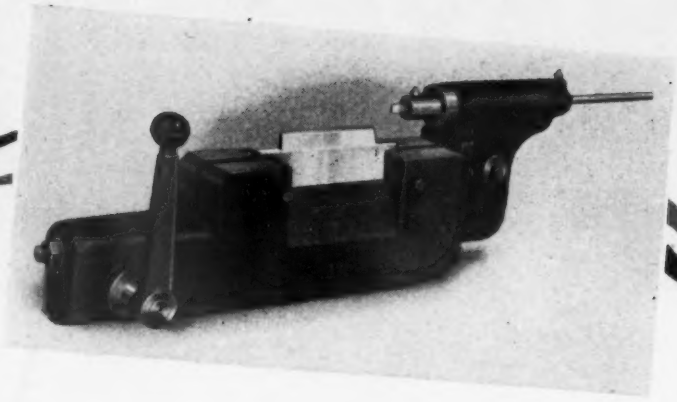


HAND INFEED GRINDING ATTACHMENT for work which is to be ground by the infeed method on No. 3 Centerless Grinders. May be obtained for one, two, or three revolutions of the handwheel to positive stop. Two revolution unit shown.

AUTOMATIC RECIPROCATING ATTACHMENT oscillates the grinding wheel to remove wheel marks and improve finish of infeed ground work. Built into the grinding wheel spindle housing.

CINCINNATI

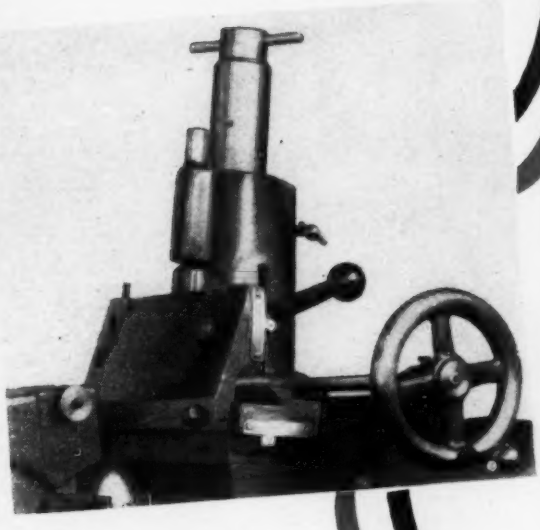
CENTER TYPE GRINDING MACHINES



INFEED WORK REST for work which is ground by the infeed method. Several sizes available depending upon width of wheel. May be arranged with hand or automatic ejector.

WHAT'S YOUR CENTERLESS PRODUCTION PROBLEM?

These Cincinnati Centerless Attachments Will Help You Find a Solution



REGULATING WHEEL PROFILE TRUING DEVICE for various types of form grinding such as multiple diameter, taper, and curved shapes. Both hydraulic and hand screw types are available.

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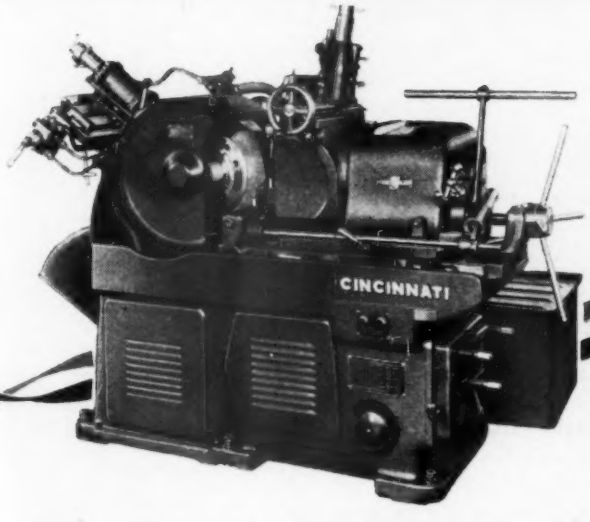

CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Ask for catalog G-456-3.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

ANY WAY YOU

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Ram Type Milling Machines

★ **Are Easy to Operate**

★ **Cut Down Idle Time**

★ **Multiply Machine Output**

From any point of view, management, production, or operator . . . Van Norman Ram Type Millers meet every milling requirement from accurate work to maximum production and economy.

- *Adjustable Cutterhead* permits conventional horizontal and vertical as well as angular milling all on one machine . . . minimizes work setups . . . cuts idle machine time. In addition, this versatility enables you to meet job to job milling requirements.
- *Increased Range* — the adjustable cutterhead and movable ram provide maximum milling capacity and versatility.
- *Front and Rear Finger-tip Controls* of all power feeds, six way rapid traverse and hand adjustments provide extreme ease of control . . . reduce worker fatigue . . . increase output. Power controls operate in the desired table, saddle and knee movement assuring maximum simplicity of operation.
- *Single Lever Feed Selector* provides quick, easy selection of the proper feed for the type of work being milled. 18 feeds are instantly available from front or rear operating position.
- *Long Life Accuracy* is assured by precision Van Norman construction. Hardened alloy steel gears and multi-splined shafts operate on anti-friction bearings . . . automatic lubrication assures thorough oiling of all moving parts . . . massive knee, saddle and table assemblies provide rigidity.

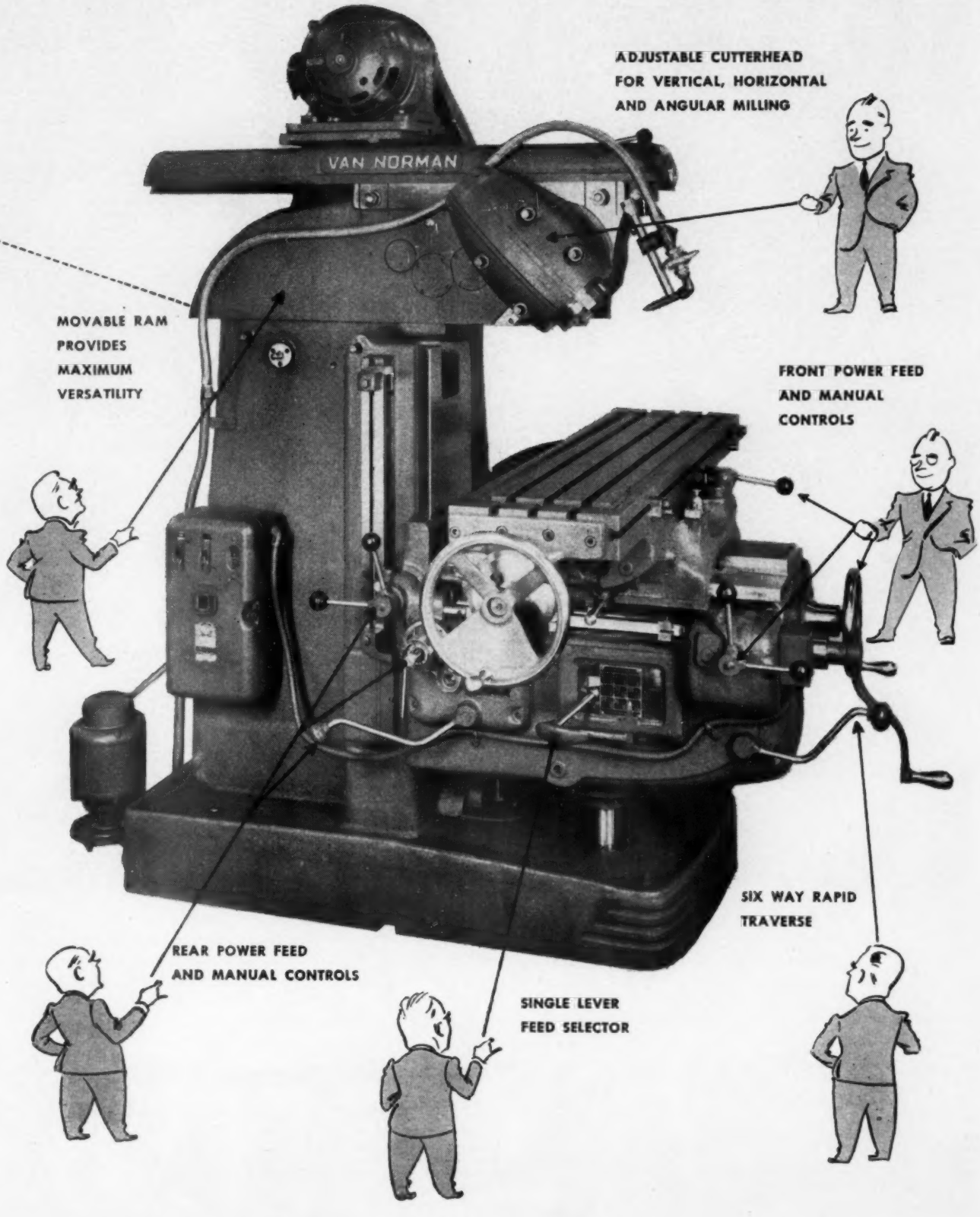
Investigate Van Norman Ram Type Millers today. They are available in many models and sizes, with plain or universal saddles, to meet every requirement for toolroom, laboratory, machine shop, pattern shop, and general purpose milling.

VAN NORMAN COMPANY

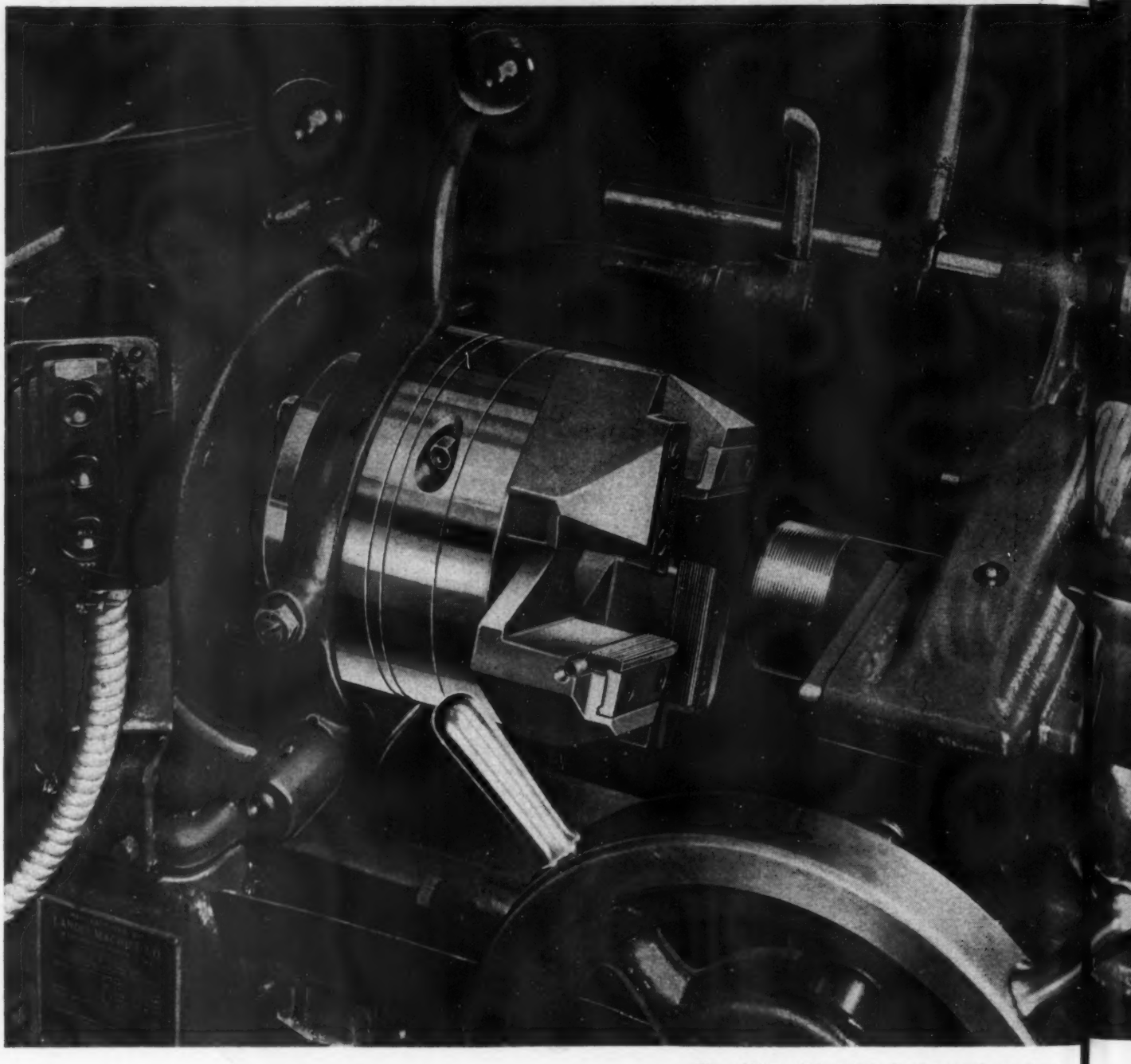
Springfield 7, Massachusetts

"It pays to Van Normanize"

LOOK AT IT...


VAN NORMAN
ADJUSTABLE CUTTERHEAD FOR VERTICAL, HORIZONTAL AND ANGULAR MILLING
MOVABLE RAM PROVIDES MAXIMUM VERSATILITY
FRONT POWER FEED AND MANUAL CONTROLS
SIX WAY RAPID TRAVERSE
REAR POWER FEED AND MANUAL CONTROLS
SINGLE LEVER FEED SELECTOR

LANDMACO



The 1½" LANDMACO Single Head Leadscrew Threading Machine illustrated has a standard capacity of ⅜" to 1½". However, machine is equipped with 1½" LANCO Die Head fitted with oversize chaser holders for producing 3½" diameter 12 pitch threads on pump stators.

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REG. U.S. TRADE-MARK PAT. OFF.

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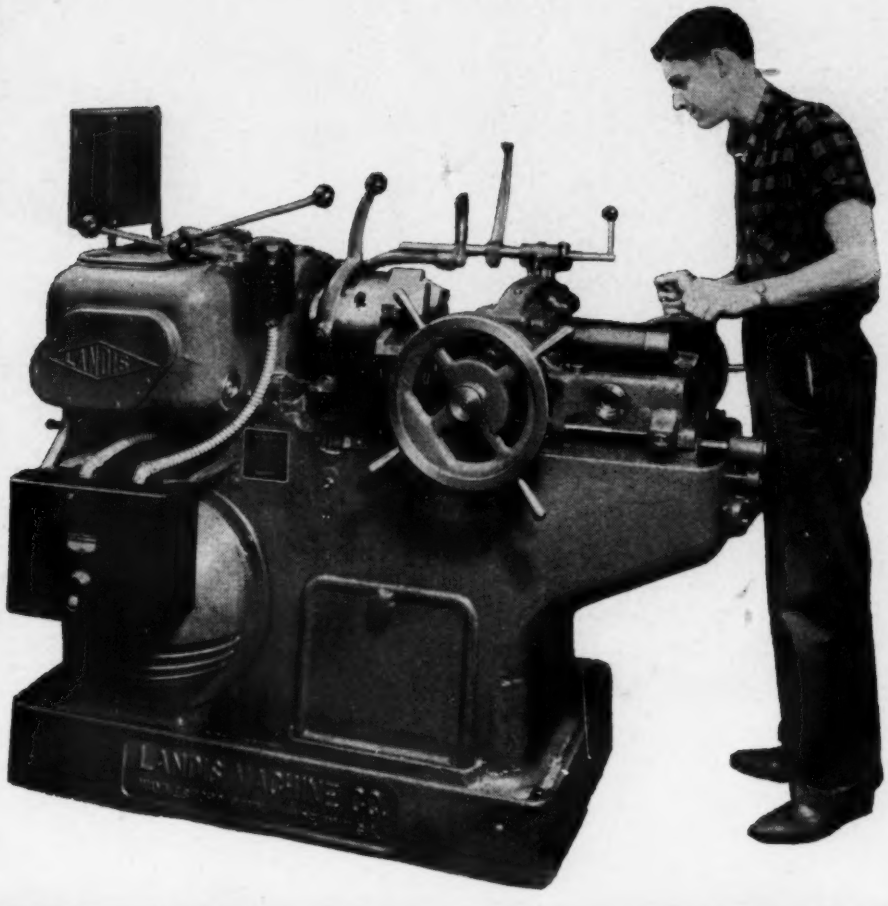
For Speed, Accuracy and Economy on a Wide Variety of Threading Jobs

Nine outstanding features—eight speed selective type gear box, vertical and horizontal adjusted carriage front; leadscrew attachments; anti-friction bearings on which gear shafts, leadscrews and spindles operate; wipers for bed guides; rack and pinion operated carriage; silent chain drive; and semi-steel bed cast in one piece with transverse bracing members; as well as double wall support for machine guides.

LANDMACO Threading Machines are built in 1" and 1½" Single, Double and Quadruple models as well as 2" and 2½" Single and Double models.

Send for Bulletin H-75



MACHINE CO. WAYNESBORO PENNA. U.S.A.

BIG HOLES

LITTLE HOLES

It makes no difference — there's an "AMERICAN" for every job.

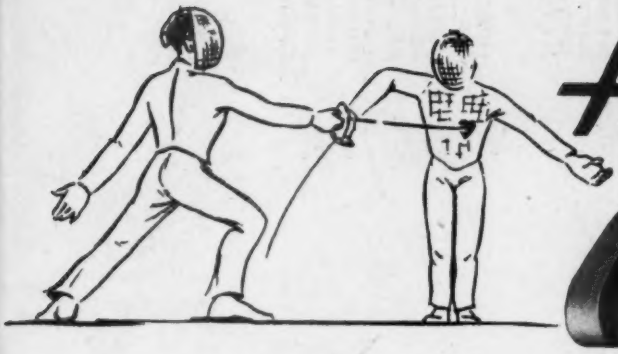
"AMERICAN" Hole Wizard Radials are meeting the challenge of intensive production without a whimper. Day in and day out in the production shops throughout the country they are drilling, boring and tapping at top speed and at the same time maintaining amazing standards of accuracy.

Manufacturing shops that have established enviable records for low cost production are using "AMERICAN" Radials.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills



Accuracy

COVEL NO. 22
UNIVERSAL CUTTER AND TOOL GRINDER
...now available for IMMEDIATE DELIVERIES

Speed

for FASTER, MORE UNIVERSAL GRINDING
ON A WIDE VARIETY OF WORK

Tool men who need more capacity, lower costs are ordering the No. 22 UNIVERSAL. It can handle work from large face-milling cutters to small taps — rapidly, accurately. A complete line of attachments enables any semi-skilled operator to do cylindrical, internal and other types of grinding on this versatile machine. See your nearest COVEL dealer or write for Bulletin A-226.

COVEL MANUFACTURING CO.
BENTON HARBOR, MICHIGAN, U.S.A.

COMPLETE WET GRINDING EQUIPMENT includes splash guards, pipe, pump and tank.

ALL-ELECTRIC POWER TABLE FEED assures smooth, rapid traverse. Six speeds available.

BALL-BEARING TABLE WAYS provide effortless table traverse.

RAPID HAND MOVEMENT OF SADDLE for cross feed available as an extra.

THREE QUICK-CHANGE SPEEDS for main spindle drive.

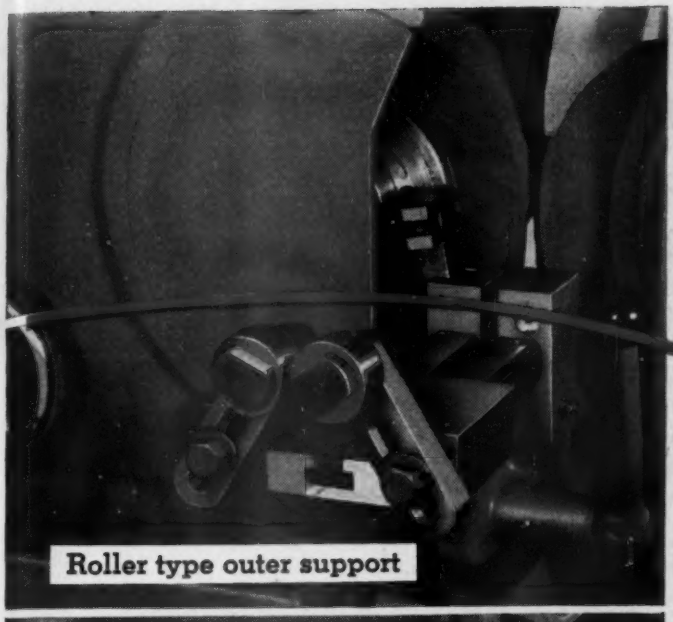
LARGE LINE OF ATTACHMENTS give this famous machine extreme versatility.

COVEL
INDUSTRIAL GRINDERS

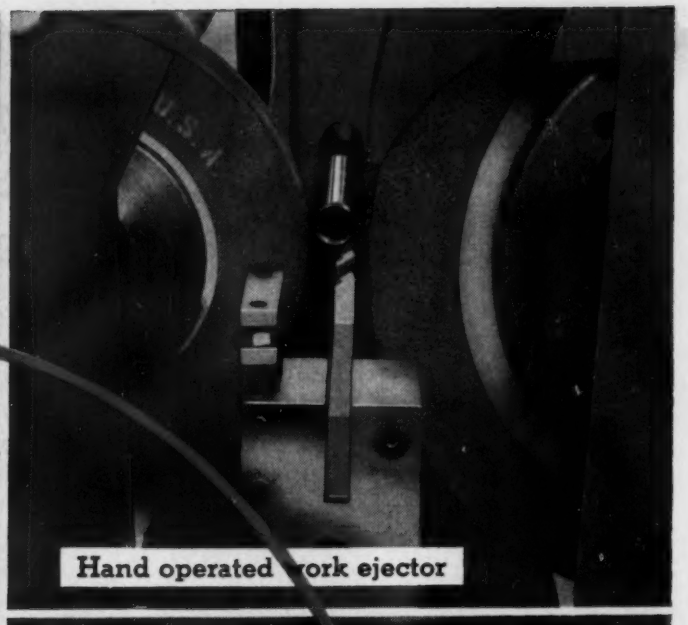
Special Fixtures Speed Output

of LANDIS TOOL centerless grinder

LANDIS TOOL
Precision Grinders

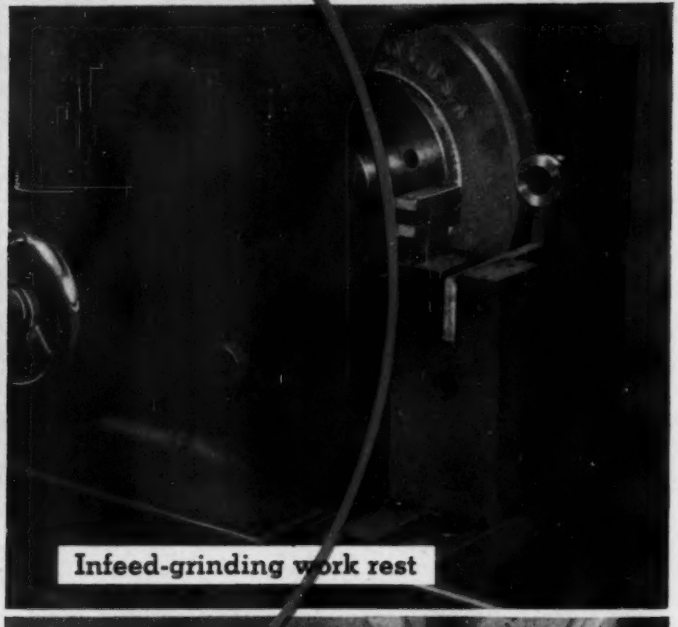


Roller type outer support

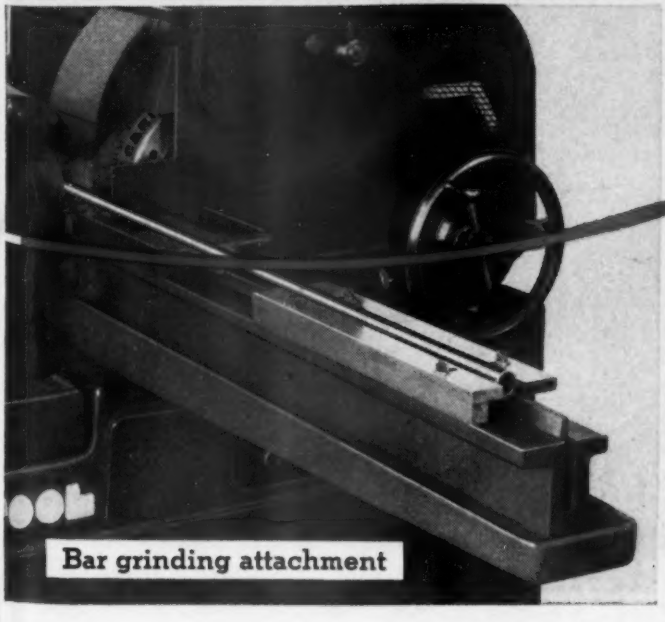


Hand operated work ejector

Regulating wheel step dressing attachment



Infeed-grinding work rest



Bar grinding attachment

Special textile spindle attachment

LANDIS TOOL COMPANY, WAYNESBORO, PA. Request Catalog T-44 for Complete details

SOUTH BEND
Precision Lathes

RUGGED
ACCURATE
DEPENDABLE

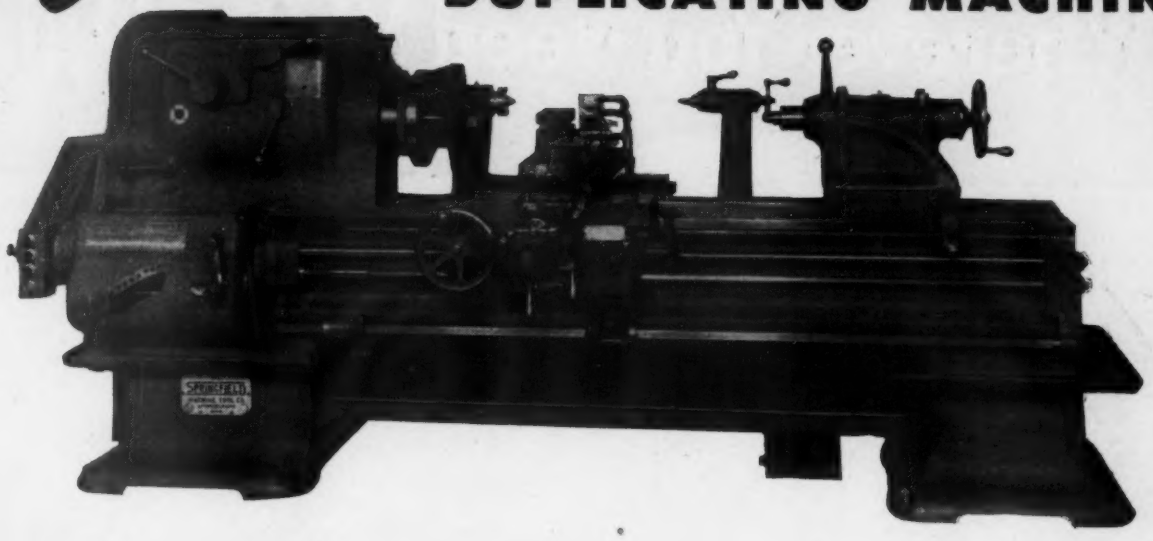
The rugged construction of South Bend Precision Lathes is best demonstrated by the fact that the great majority of all South Bend Lathes ever made still are giving satisfactory service after years of daily use. Their rugged construction explains why, even after many years of service, they continue to produce toolroom and production work to close tolerances. It explains, too, why they have earned for themselves a reputation for dependable performance in all types of installations which are representative of modern industry. Because of their rugged construction, lifetime accuracy, and dependability, plus unusual versatility, you will find it to your advantage to specify South Bend Precision Lathes for your next installations. Write today for Catalog 100-D which illustrates in color and describes all South Bend Precision Engine Lathes, Toolroom Lathes, and Turret Lathes.

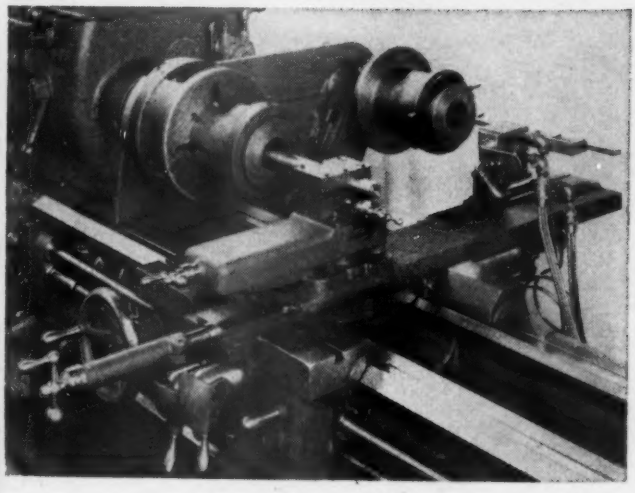
SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906

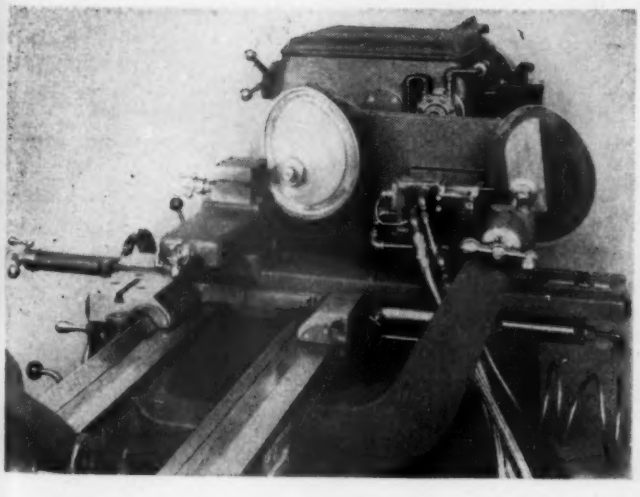
New SPRINGFIELD PROFILING AND DUPLICATING MACHINE





... reproduces many complicated forms

At left, the Springfield Profiling Machine in operation, reproducing a bottle mold. A master cylinder, located underneath and controlled by a stylus valve, guides the tool in proper contour. Any type of templet may be used. Templets requiring rotation are driven by an adjustable chain drive from the spindle. Twelve spindle speeds are available and speeds may be further reduced with a two-speed motor.

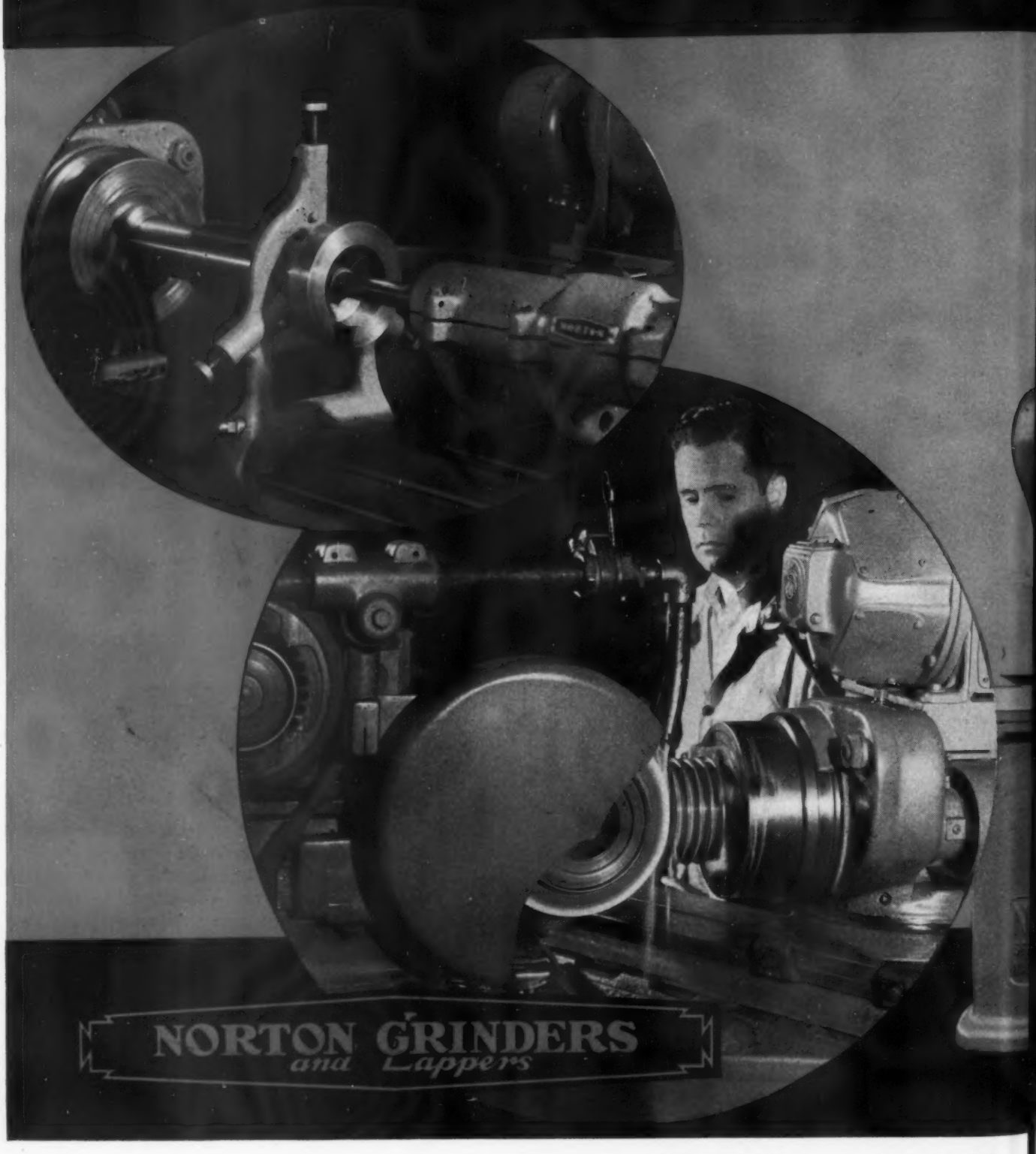


... from cams to bottle molds, interior, exterior

At left, producing a contour—cam. Note that only a thin metal pattern is needed. The hydraulic pump unit, including oil tank, motor, pump, relief valve and pressure gage is separate and may be located conveniently. Work requiring operations parallel or across the machine can be handled with surprising accuracy. Operators have a clear view of the work and can easily convert to engine lathe by adjustment of two screws.

SPRINGFIELD MACHINE TOOL COMPANY
SPRINGFIELD OHIO

In the Tool Room . . .
On the Production Line . . .
Wherever You Need VERSATILITY



The NORTON TYPE C Universal Grinder

THIS Norton machine is recommended for miscellaneous small-lot, general production or tool room work. Its versatility enables it to handle a diversity of work — with ease of setup in a minimum of time. The standard equipment adapts it for external, cylindrical, internal and face grinding operations as well as for cutter sharpening, angular slide and other diverse applications.

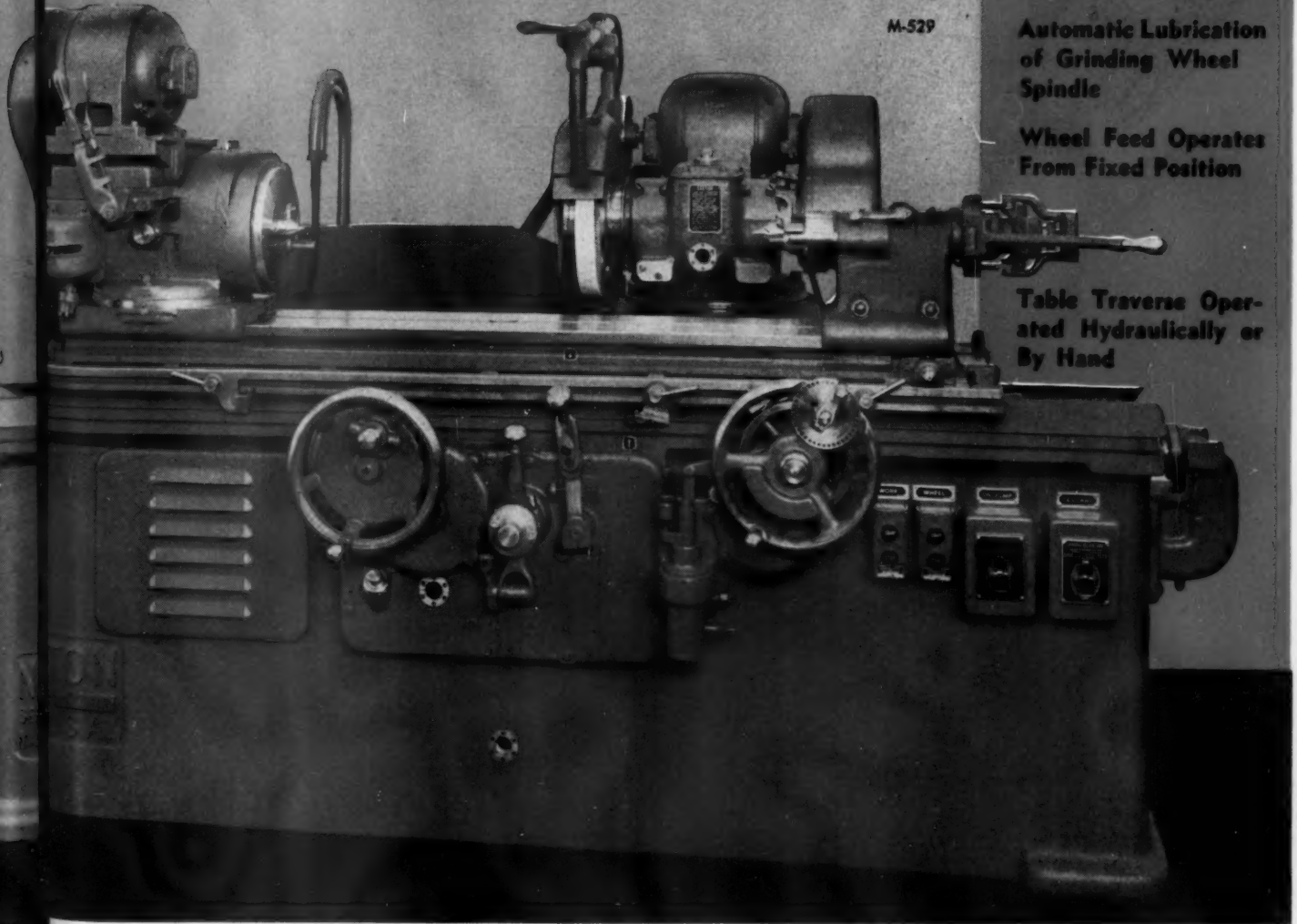
Built in 12", 14" and 16" swings;
Each in 36", 48" and 72" lengths.

Catalog 1668, giving full details and many illustrations, sent on request.

NORTON COMPANY, WORCESTER 6, MASS.

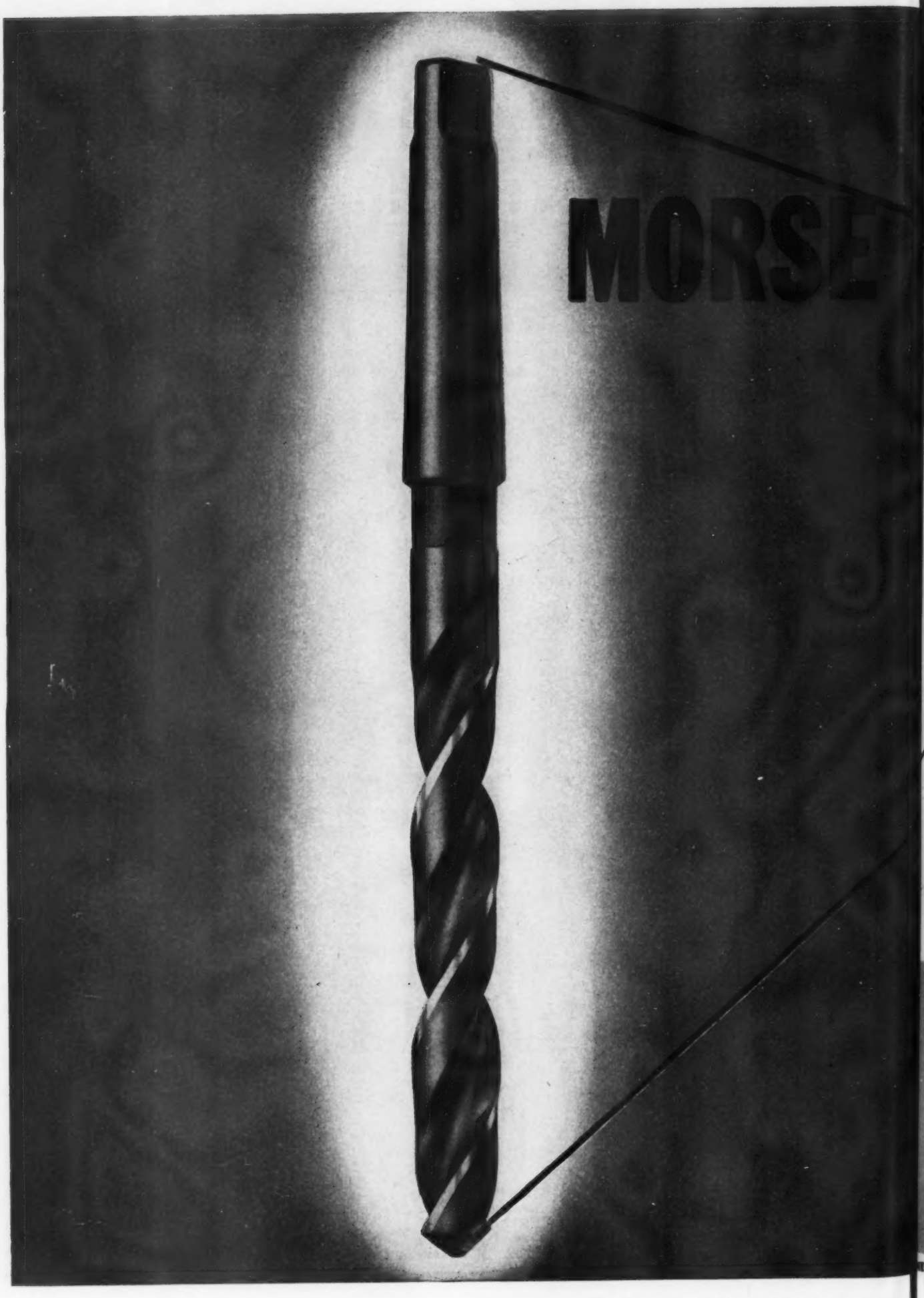
Distributors in All Principal Cities

M-529

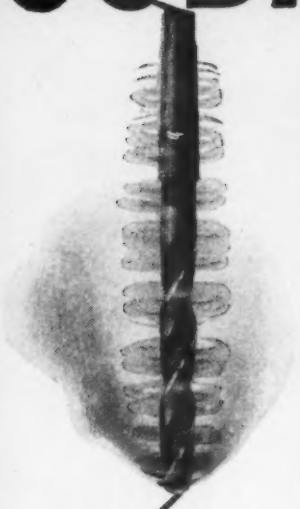


FEATURES

- Self-contained Motor Drive
- Massive Base Construction
- Table Ways Lubricated By Force Feed
- Rigid, Flat Top, Swivel Table
- Self-contained Universal Headstock — Rotates 360°
- Quick Acting Lever or Screw Type Footstock Optional
- Universal Grinding Wheel Head—Rotates 360°
- Rugged Wheel Spindle Design
- Automatic Lubrication of Grinding Wheel Spindle
- Wheel Feed Operates From Fixed Position
- Table Traverse Operated Hydraulically or By Hand


MORSE

COBALT DRILLS PERFORM



Where Standard High-Speed Steel Drills Fail!

ON THE *TOUGHEST* GOING . . . manganese, hard steels, castings, forgings, and other difficult to drill material . . . Morse *Cobalt* Drills out-perform standard high-speed drills.

What's more, Morse *Cobalt* Drills can be run about *25% faster.* They hold their cutting edges far longer, too . . . and they have the rigidity and strength to buck severe strains, when used in a rigid drill press with positive drive that will stand extreme point-pressure.

NOW . . . whether you drill tough steel, brass, plastics, or aluminum, always bear in mind that there is one Morse Drill of the right specification, length, diameter and twist-cut to do *your* job *best, at lowest cost.* And bear in mind, too, that with all these factors, it always saves you money to leave the complete specification up to us . . . through your distributor of Morse Twist Drills, Reamers, Taps, Dies, Milling Cutters, End Mills.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manu

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

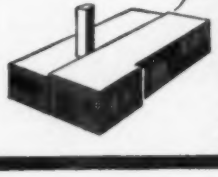
Now

THIS COMPLETE WAREHOUSE SERVICE BRINGS *Carpenter* STEELS TO YOUR PLANT *Faster*

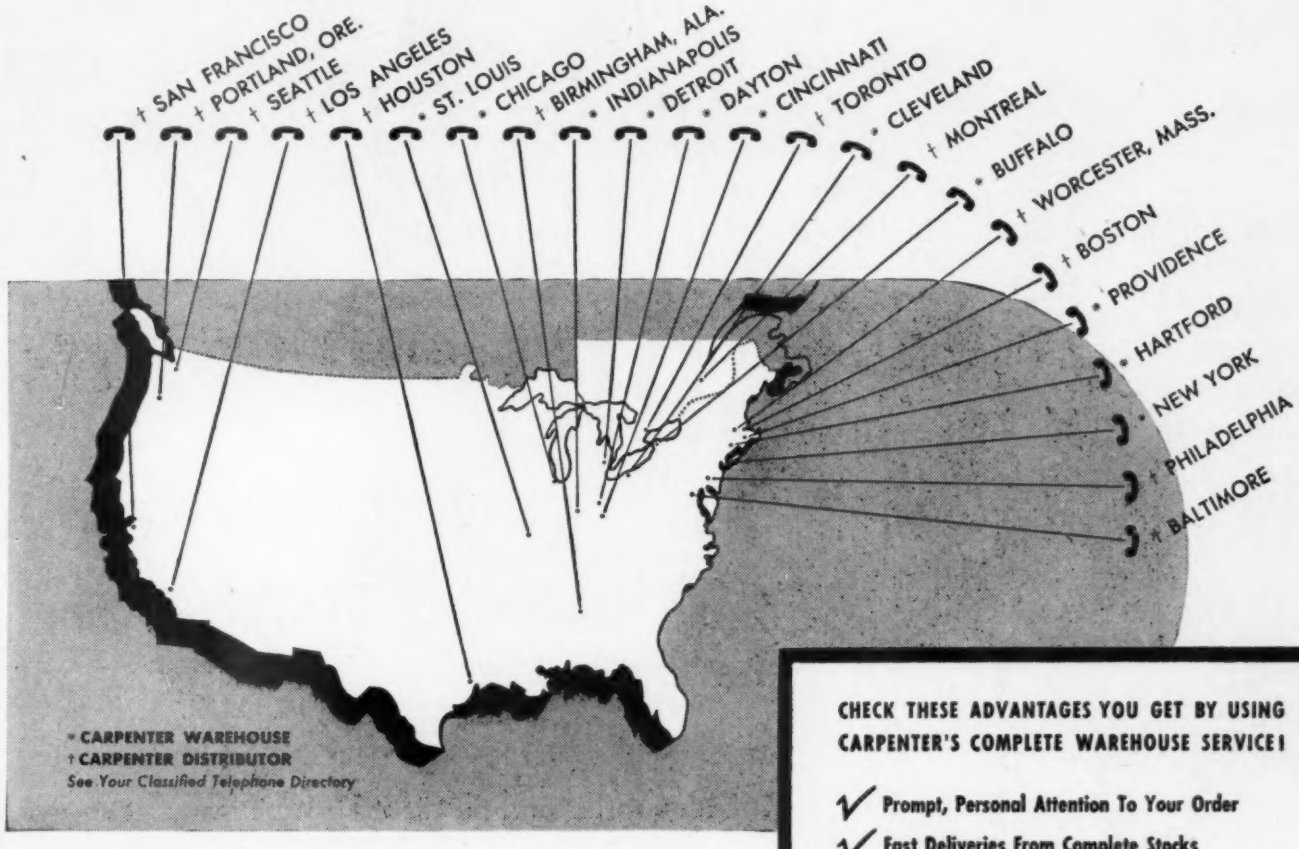
Call YOUR CARPENTER WAREHOUSE FOR FAST DELIVERY OF - -

Carpenter

- Matched Tool Steels
- Stainless No. 5 and No. 8 Free-Machining Bars
- High Speed Tool Bits
- Tool Steel Drill Rods
- Special Purpose Alloy Steels



RIGHT NOW you can get really quick delivery of standard sizes from your nearest Carpenter Warehouse or Distributor. With Carpenter's expanded warehouse service, 90% of the metalworking industry is within 24-hour delivery from a Carpenter Warehouse or Distributor. And in addition to this expanded warehouse service, you are assured of getting top-notch quality in every lot of Carpenter Steel you use. Carpenter Warehouses and Distributors, conveniently located throughout the U. S. and Canada, are ready to give you prompt service NOW.



TO HELP YOU cut production costs and improve performance, we can give you complete, printed information on the proper selection and use of Carpenter Quality Controlled Steels. Contact your nearby Carpenter Representative today for the information you need.

CHECK THESE ADVANTAGES YOU GET BY USING CARPENTER'S COMPLETE WAREHOUSE SERVICE!

- ✓ Prompt, Personal Attention To Your Order
- ✓ Fast Deliveries From Complete Stocks
- ✓ Choice Of Wide Range Of Sizes
- ✓ Lower Inventories In Your Plant
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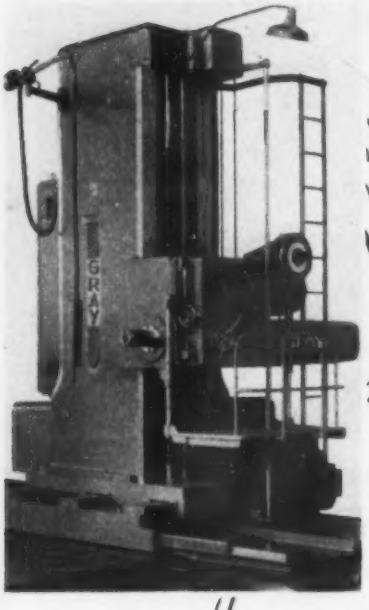
THE CARPENTER STEEL COMPANY • 109 W. BERN STREET, READING, PA.

Carpenter

QUALITY CONTROLLED

TOOL, ALLOY & STAINLESS STEELS

GRAY *Electrical Woodpecker**



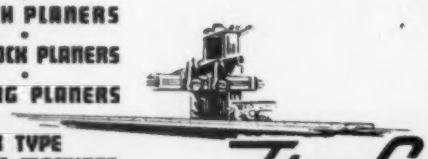
You will agree "it's a bird" when you realize that it enables you to set the twenty-five ton column within a quarter of a thousandth of an inch by simply operating a jogging button.

This is one of the many exclusive features of Gray Boring, Drilling and Milling Machines.

Write for full illustrated descriptive Bulletin No. 48.

* *Protected by patent No. 2,354,413*

DOUBLE HOUSING
OPENSIDE PLANERS
SWITCH PLANERS
DIE BLOCK PLANERS
MILLING PLANERS
PLANER TYPE MILLING MACHINES
HORIZONTAL BORING MACHINES



The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

Sold in Canada by Upton, Bradeen and James Ltd. ● Sold in Latin America by Machine Affiliates.

CINCINNATI

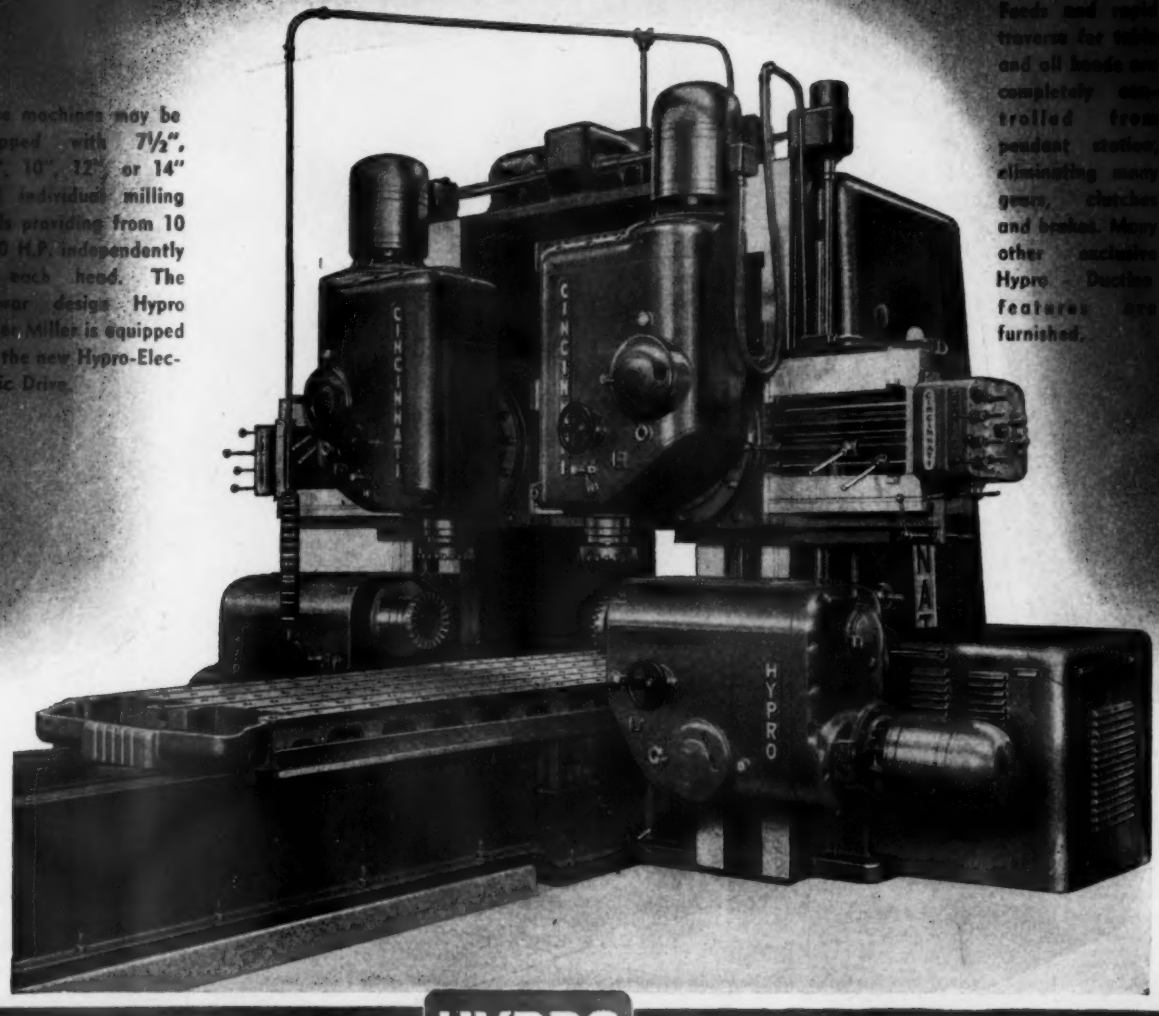
HYPRO

60" x 48" x 20' HYPRO PLANER TYPE MILLER—10" QUILL HEADS

Manufactured in all sizes from 30" to 120" inclusive

These machines may be equipped with 7½", 8¾", 10", 12", or 14" quill individual milling heads providing from 10 to 50 H.P. independently for each head. The postwar design Hypro Planer Miller is equipped with the new Hypro-Electronic Drive.

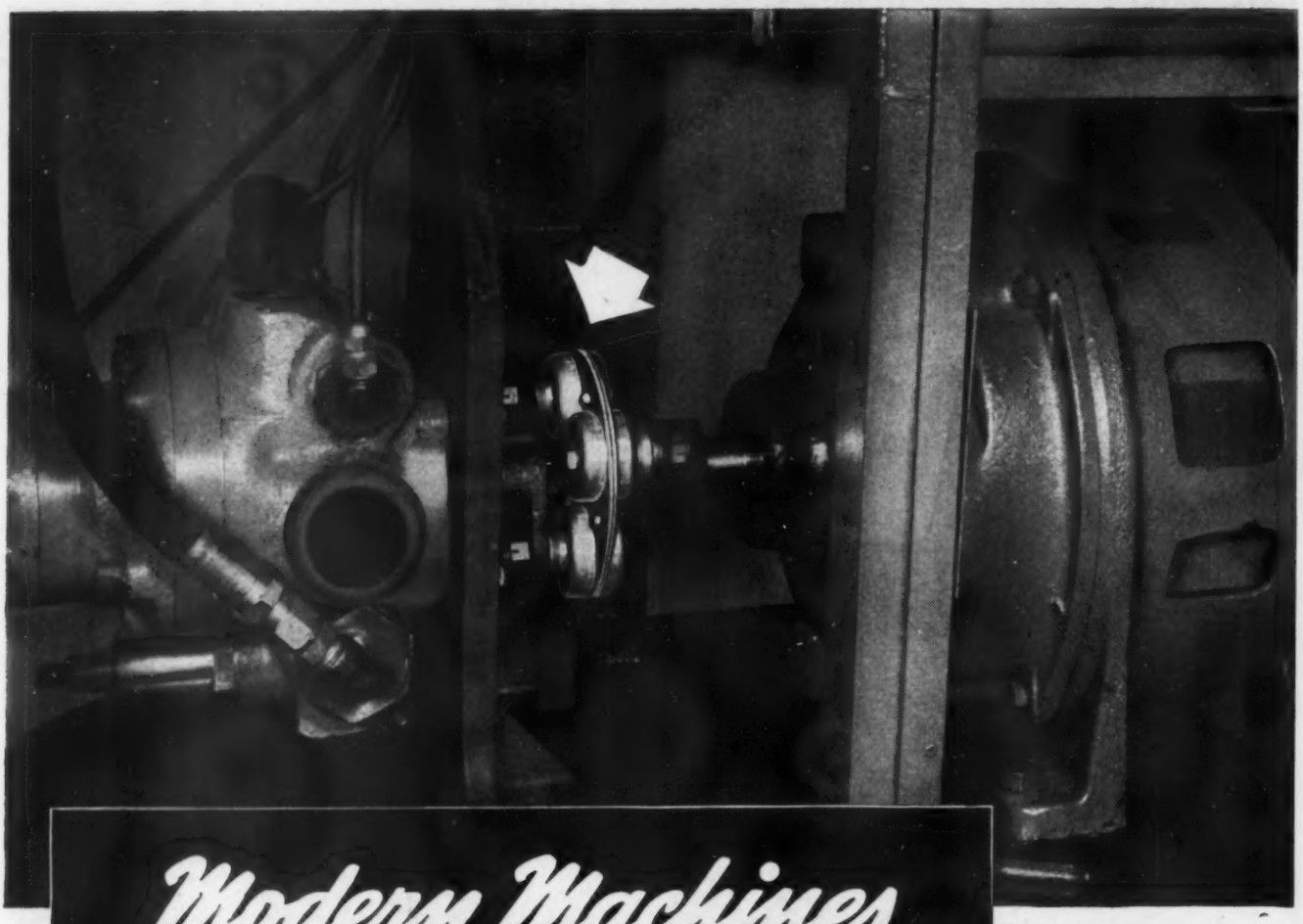
Feeds and rapid traverse for table and all heads are completely controlled from pendant station, eliminating many gears, clutches and brakes. Many other exclusive Hypro Duction features are furnished.



THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO



Modern Machines Deserve MORFLEX Couplings

Chicago Pneumatic Tool Company's portable hydraulic system, adaptable to cold riveting, piercing, pressing and pulling operations, uses Morflex Couplings on the power unit shaft between motor and pump. Morflex Couplings absorb shock, vibration, prolong machine life in the severest service. MORSE CHAIN COMPANY, Detroit 8, Michigan; Ithaca, N. Y.

A PRODUCT OF B-W BORG-WARNER

MORSE ROLLER and SILENT CHAINS and COUPLINGS

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The Army and Navy are studying our natural caves, such as Carlsbad and Mammoth, in order to determine their usefulness as war-time shelters for industry.

get ready with CONE for tomorrow

Weirton Steel Co. now pipes oxygen around its plant like water.

get ready with CONE for tomorrow

Centrifugal casting of plastics is claimed by Rezolin Co. of Beverly Hills to offer the same advantages that the process does to the casting of metal.

get ready with CONE for tomorrow

Dow Corning has tested paints made from silicone resins and aluminum powder on diesel manifolds and furnace doors at temperatures as high as 600 degrees Fahrenheit.

get ready with CONE for tomorrow

A joint committee of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers has standardized the sizes of large steam turbines and the first standard unit for electric power generation is now under construction.

get ready with CONE for tomorrow

Federal Telephone and Radio Corp. claim that their new small-size selenium rectifier can replace as many as 29 different rectifier-type tubes now used in radio receivers.

get ready with CONE for tomorrow

International Business Machine Corp. is offering the Chinese a typewriter that will print 5,400 ideographs by the use of 43 keys. An experienced user can write about 45 words per minute (English record 149).

get ready with CONE for tomorrow

American Steel and Wire Co. has a quarter-inch nail that can be used to tack tags to cold steel ingots.

Texaco has developed a new synthetic grease for aircraft instruments, controls, cameras and small motors that is usable from 100 degrees below zero to 300 degrees above.

get ready with CONE for tomorrow

Recent tests indicate that the new railroad car stabilizer, developed by Westinghouse from the gyroscopic tank gun mount, shows great improvement in riding comfort over all kinds of roadbeds.

get ready with CONE for tomorrow

Welded tubular chassis, helical springs, independent axles, 1000 pounds less weight and a lower powered engine are among the details of the proposed new low-priced Chevrolet.

The new Duco Metalli-Chrome automobile lacquer uses particles of aluminum to give a metallic luster and is made in 200 colors.

get ready with CONE for tomorrow

Slight bends in the last threads of a new lock nut made by Grip Nut Co. permit it to turn freely through most of its travel, yet prevent it from loosening when finally set up.

get ready with CONE for tomorrow

United Engineering and Foundry will pour a 243-ton casting for a press base which will take one month to cool and another month to anneal.

get ready with CONE for tomorrow

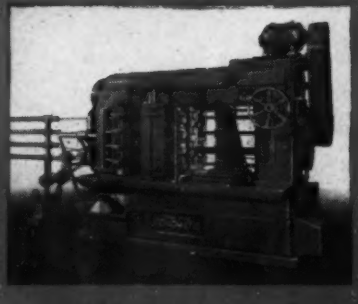
University of California scientists have produced a standard for the measurement of length ten times as accurate as the cadmium light ray now accepted by using a light wave from transmuted mercury (made from gold) excited by a high frequency radio beam.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

FOUR

in ONE!

Four parts machined in the time for one is *profitable* production.
The set screw blanks shown are made from SAE-3135 bar stock within the time and precision specified—and *four* at a time.
Why not investigate the *profitable* adaptation of the Conomatic VERTICAL to work in your shop? Write for literature.



Ask your CONE *representative to show you our new color motion picture*

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

34

If it's hydraulic pumps you need- we can give them to you *fast!*

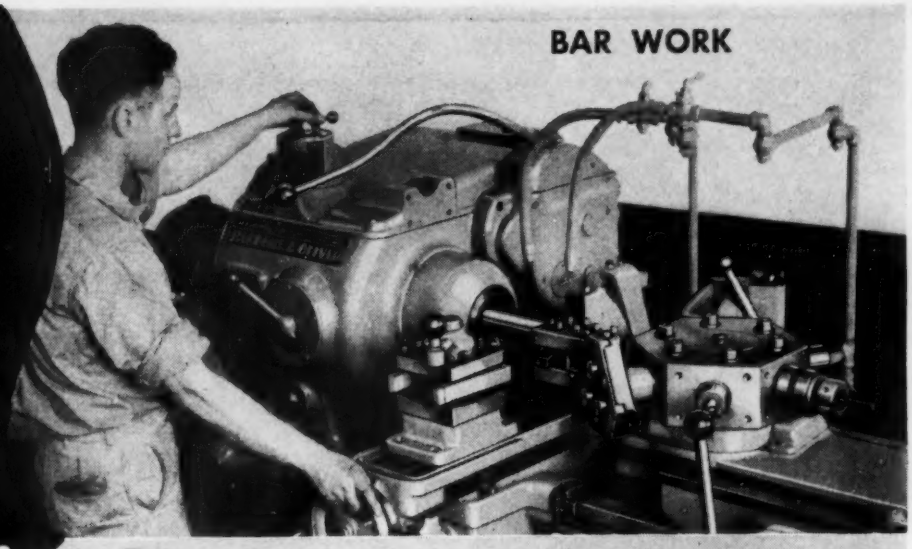
If your products require hydraulic pumps that are efficient and dependable—above all, if you need them *now*—let's get right down to business! For deliveries to meet *your* production schedule—phone, wire or write today.

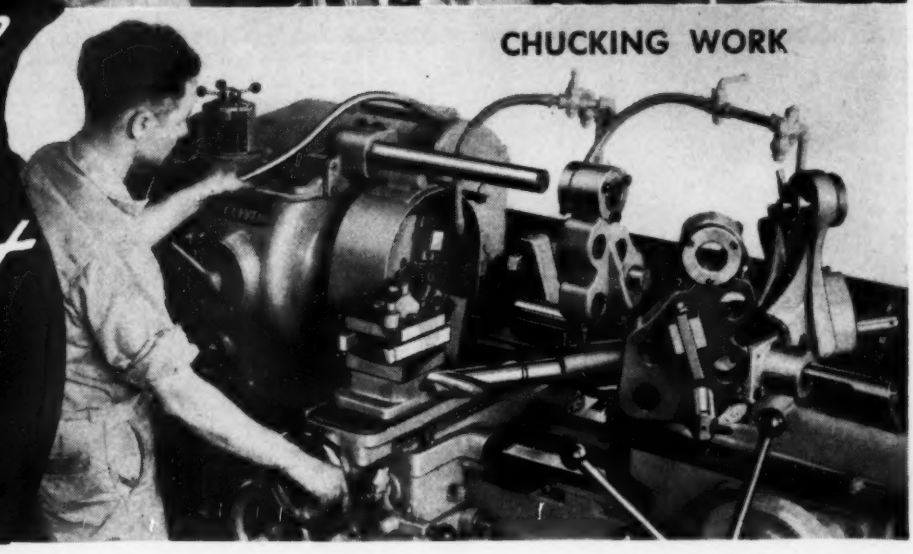
GEROTOR

GEROTOR MAY CORPORATION
Baltimore 3, Md. • MUlberry 8585

HYDRAULIC PUMPS

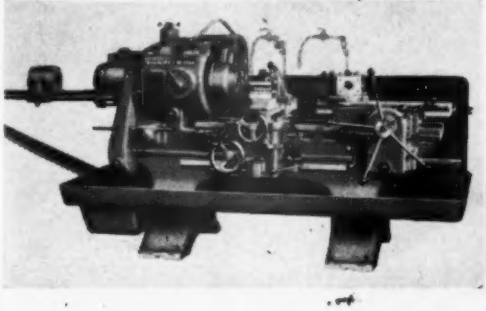
MORE WORK in *less time* with *less effort*





Hydraulic power feeds the bar fast — closes the chuck fast — grips the bar firmly for heavier cuts — stops the spindle and shifts gears for a preselected speed. The result is more production with less operator fatigue.

The many prominent features of this outstanding Universal Turret Lathe makes it today's best buy for reducing costs. Let us send you complete details.



BARDONS & OLIVER, INC.
1133 WEST 9TH STREET • CLEVELAND 13, OHIO

After 10 Years Service

...ACCURATE TO .0005!

HIGH PRECISION—LOW MAINTENANCE

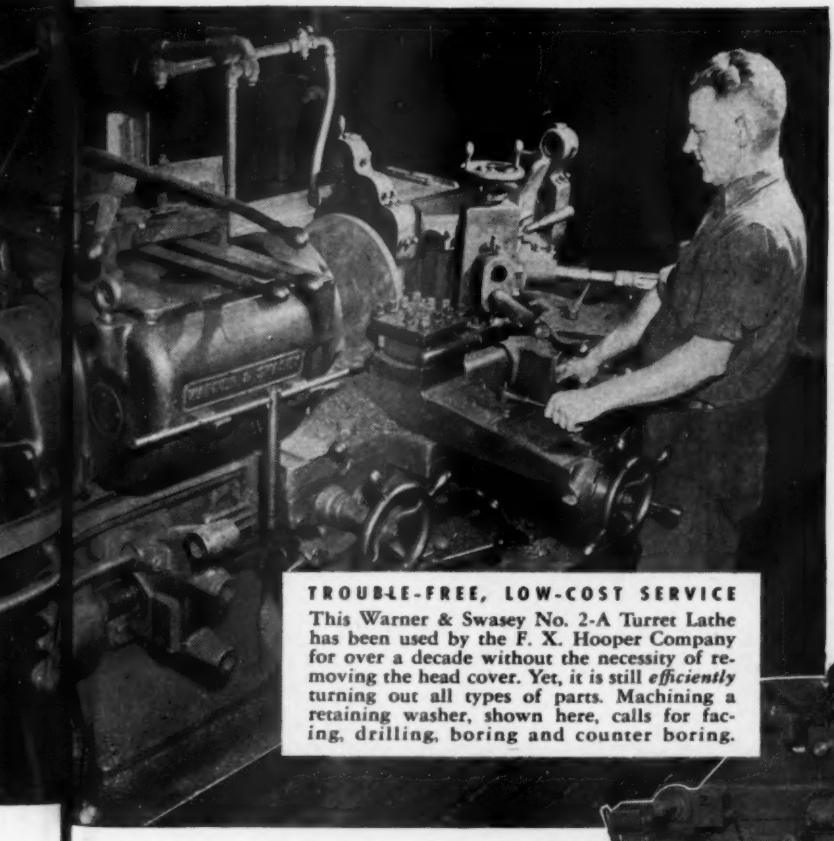
After 10 years service in the F. X Hooper Company shop, this Warner & Swasey No. 5 Universal Turret Lathe has retained new machine tool accuracy with only one minor repair. Extreme precision is essential for the many parts it turns out. Machining specifications often require holding tolerances to .0005".

TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING

● *"Precision Built* for *Precision Results,"* is the slogan used by the F. X. Hooper Company, Glenarm, Md., to describe the quality of paper box-making machinery they manufacture. They know that the close register produced by their machines depends on how accurately the separate parts that go into these machines are made. That is why Warner & Swasey Turret Lathes have been used for years in machining precision parts for the Hooper Printer-Slotter.

Two Warner & Swaseys in the Hooper plant have 10-year service records of outstanding performance and low-cost maintenance. One, a No. 5 Ram Type Warner & Swasey, has been used on work demanding consistent precision to tolerances of .0005", yet its head cover has never been removed, and only once has it needed repair parts—a set of lockbolts and bushings. The other, a No. 2-A Saddle Type Warner & Swasey, has given equally good service for ten years (19 hours per day for the past 6 years) without head cover removal and with a minimum of part replacements—2 sets of rapid traverse nuts.

The service records of these two machines are not unique—rather, they are typical of what many plants using Warner & Swaseys are experiencing. And they are typical of the results you may expect when you invest in new Warner & Swasey Turret Lathes for your shop.

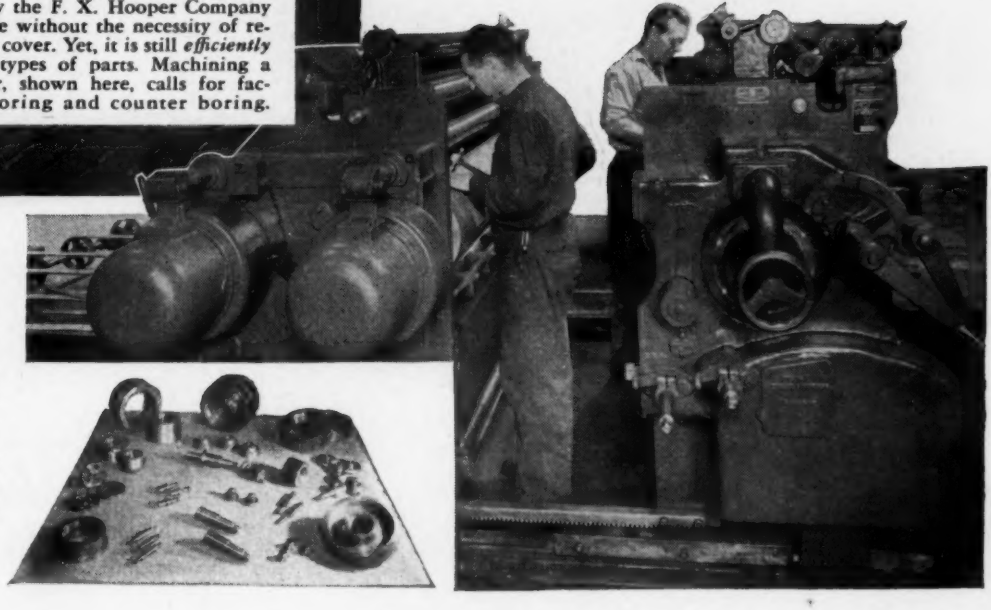


TROUBLE-FREE, LOW-COST SERVICE

This Warner & Swasey No. 2-A Turret Lathe has been used by the F. X. Hooper Company for over a decade without the necessity of removing the head cover. Yet, it is still *efficiently* turning out all types of parts. Machining a retaining washer, shown here, calls for facing, drilling, boring and counter boring.

You Can Machine it Better... Faster... for Less... with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland



VARIED PRODUCTION CALLS FOR VERSATILITY

This picture shows a *Hooper Printer-Slotter,* a modern box-making machine that requires a wide variety of precision finished parts, some of which are shown in the insert. Warner & Swasey Turret Lathes can turn them out quickly with standard tooling, eliminating the need for time-consuming set-up changes.

MACHINES . . .

NO JIGS NEEDED

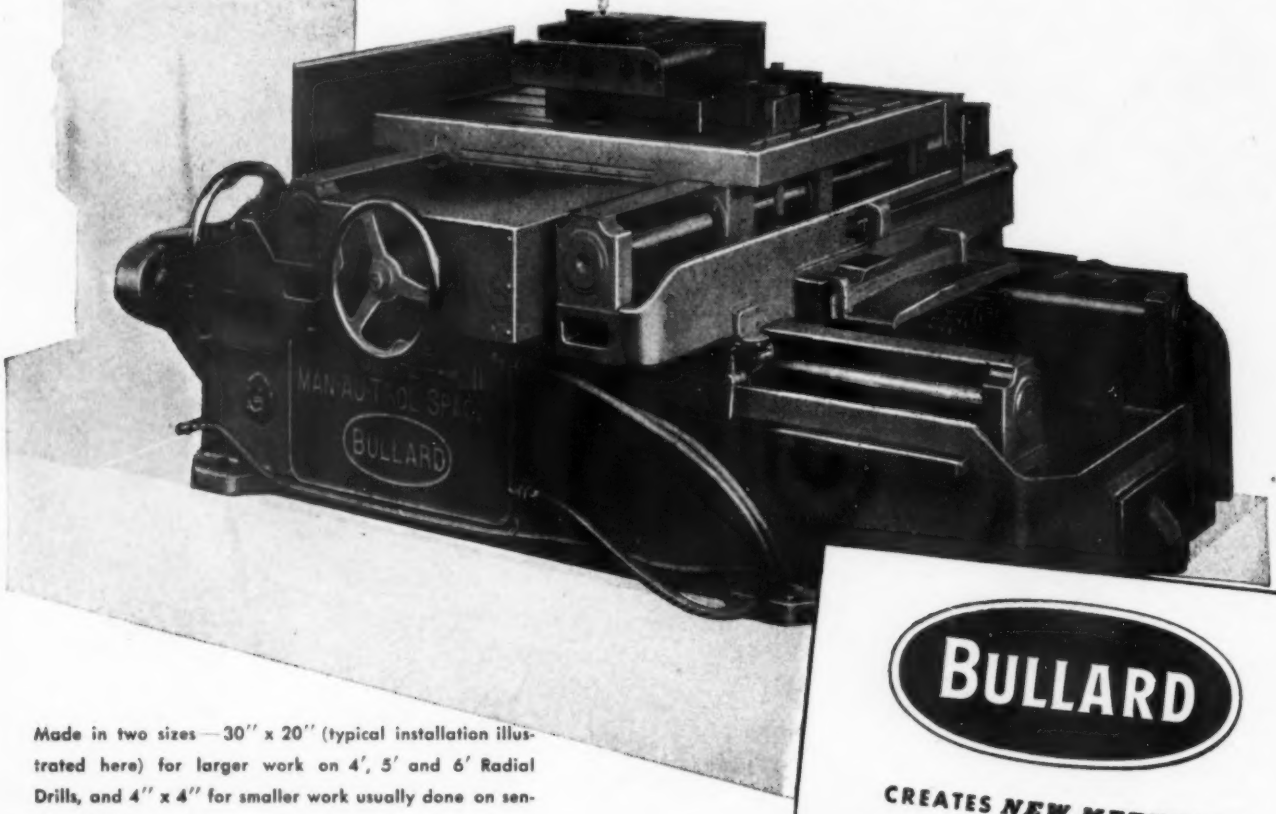
for drilling, boring, reaming and tapping

NEW Bullard MAN-AU-TROL Spacer Increases Speed and Reduces Cost of Drilling Operations

Now . . . with Bullard MAN-AU-TROL Spacers installed on your drills . . . you can start drilling, boring, reaming or tapping just as soon as your engineering drawings are ready.

Working from a master chart, the operator quickly, easily and accurately sets lateral and longitudinal position stops to match the specified pattern of holes. Then, the manually activated Spacer automatically repeats that pattern so that the holes are held *to the highest standard of commercial spacing accuracy.* Easy change-over from job to job and adaptability to an endless variety of work sizes and shapes makes the Spacer ideal for diversified shop schedules.

Consider the time, money and labor you will save when Bullard MAN-AU-TROL Spacers eliminate the need for designing, making, handling, repairing and storing hole-locating jigs. Write for MAN-AU-TROL Spacer Bulletin. The Bullard Company, Bridgeport 2, Connecticut.

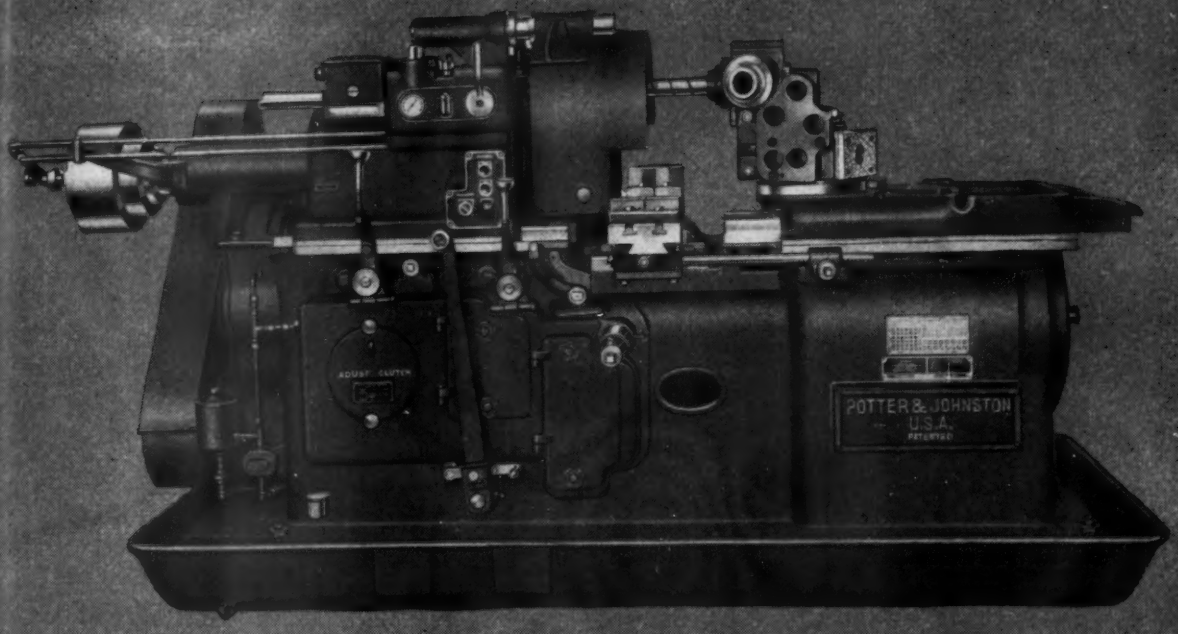


Made in two sizes—30" x 20" (typical installation illustrated here) for larger work on 4', 5' and 6' Radial Drills, and 4" x 4" for smaller work usually done on sensitive drills.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

The P&J 4 D MANUFACTURING AUTOMATIC CHUCKING AND TURNING MACHINE



. . . . . DUPLICATION OF SMALL PARTS CAN BE HANDLED AT LOWER COST...ON THIS MODERN MACHINE

Quality of finished product, increased output and an appreciable reduction in overall production costs as compared with hand machines makes the Model 4D P&J machine an invaluable means for machining a wide variety of small duplicate parts. It provides versatility in tooling and with its 15 changes of speed, arranged in five sets of three automatic changes with feeds varying directly with the spindle speed, its operation can be readily and effectively adapted to the specific job it is set up to handle.

Other features of this rugged, compact machine include: a Timken mounted spindle high carbon forged steel; headstock gearing of chrome nickel steel, heat treated and running in a bath of oil; all shafts of alloy steel, heat treated and mounted on ball bearings; speeds from 24 to 335 RPM; 27 feeds in geometric progression; cross slide mechanism fully enclosed and operating in an oil bath; rigidly constructed turret slide provided with hardened and ground inserts to form bearing on base ways.

●

Specifications

Swing over bed . . . 21" dia.
Swing over cross slide . . . 9¾" dia.
Cross slide travel . . . 3¼" each way
Number of turret faces . . . 5 std., 4 and 6 special
Hole in turret . . . 2" dia.
Turret feed . . . 5½".

●

Complete details on this machine are contained in Bulletin 112, available promptly on request.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

FOR UNIFORMS THAT ARE *RIGHT* ON THE JOB—DEMAND

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"

Look For This Label in Your Uniforms and Work Clothes!

UNIFORMS AND WORK clothes of durable Reeves Army Twill stay smart looking longer—even after repeated washings. Their high tensile strength means rugged wearability. Vat dyed colors are fast to sun, water and perspiration. Sanforized Shrunk*, they retain smart tailoring. Remember—over 90 million yards of this same fabric helped equip America's fighting forces—exceeding Government specifications under the most trying climatic and combat conditions.

**Residual shrinkage less than 1%*

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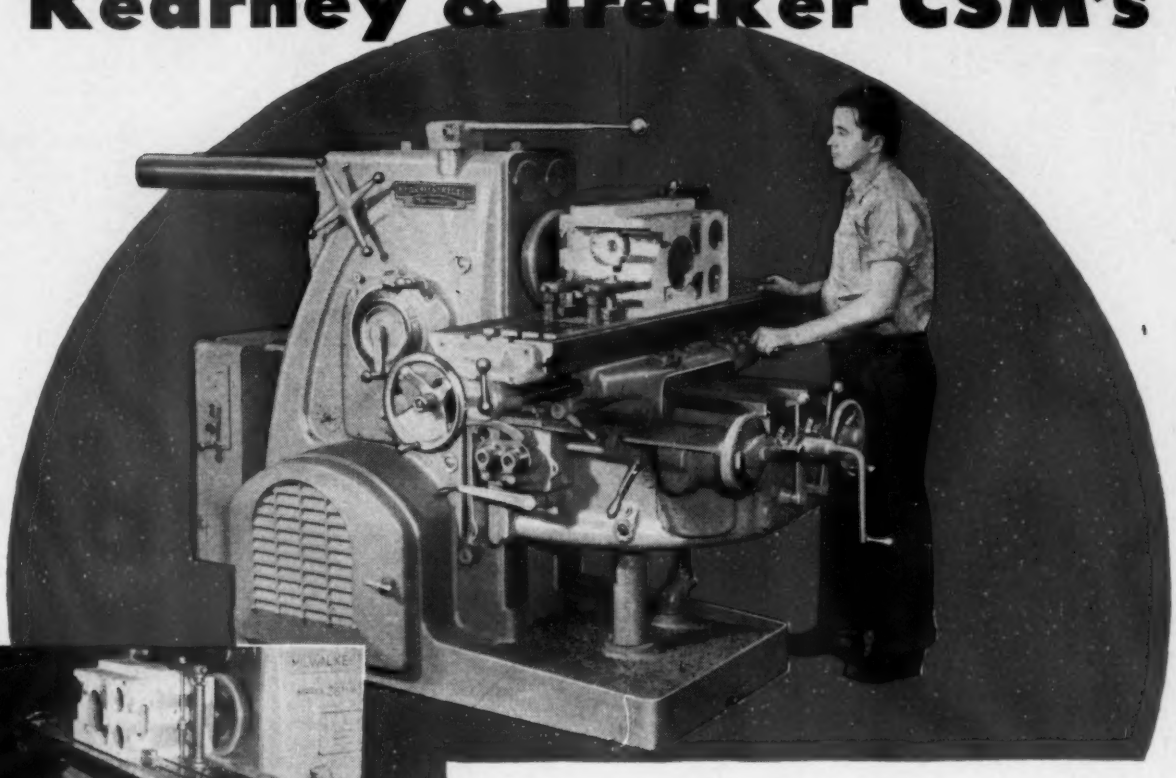
54 WORTH STREET, NEW YORK 13, N. Y.

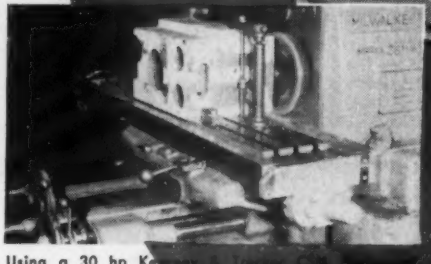
REPRESENTATIVES IN *Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • St. Louis • Montreal • Toronto*

The Most Powerful Milling Machines of Their Type!

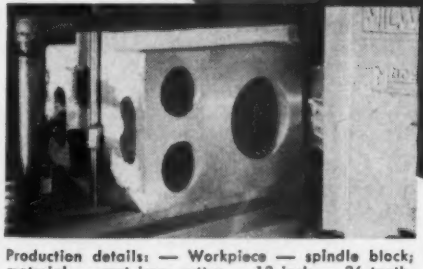
20-30-50 hp

Kearney & Trecker CSM's





Using a 30 hp Kearney & Trecker CSM, [illegible] with carbide cutters, total production time reduced 43% on this face milling operation.



Production details: — Workpiece — spindle block; material — cast iron; cutter — 12 inch — 26 tooth, full-back face mill; surface speed — 295 sfm; feed per tooth — .014 inch; depth of cut — 3/16 inch to ¼ inch.

Machine Time Reduced 87%: — Workpiece — bearing shell; material — cast steel; cutter — 10 inch, 12 tooth CSM face mill; surface speed — 460 sfm; feed per tooth — .010 inch; depth of cut — 3/16 inch to ¼ inch.

★ You get new high rates of metal removal — ferrous and non-ferrous — without sacrifice of precision.

★ — you get closer tolerances — finer finishes — precision performance—through smooth flow of power to the cutter.

★ — expressly designed for carbide milling of steel but adapted to all-purpose milling, as well.

★ — broad range of application — wide range of speeds and feeds.

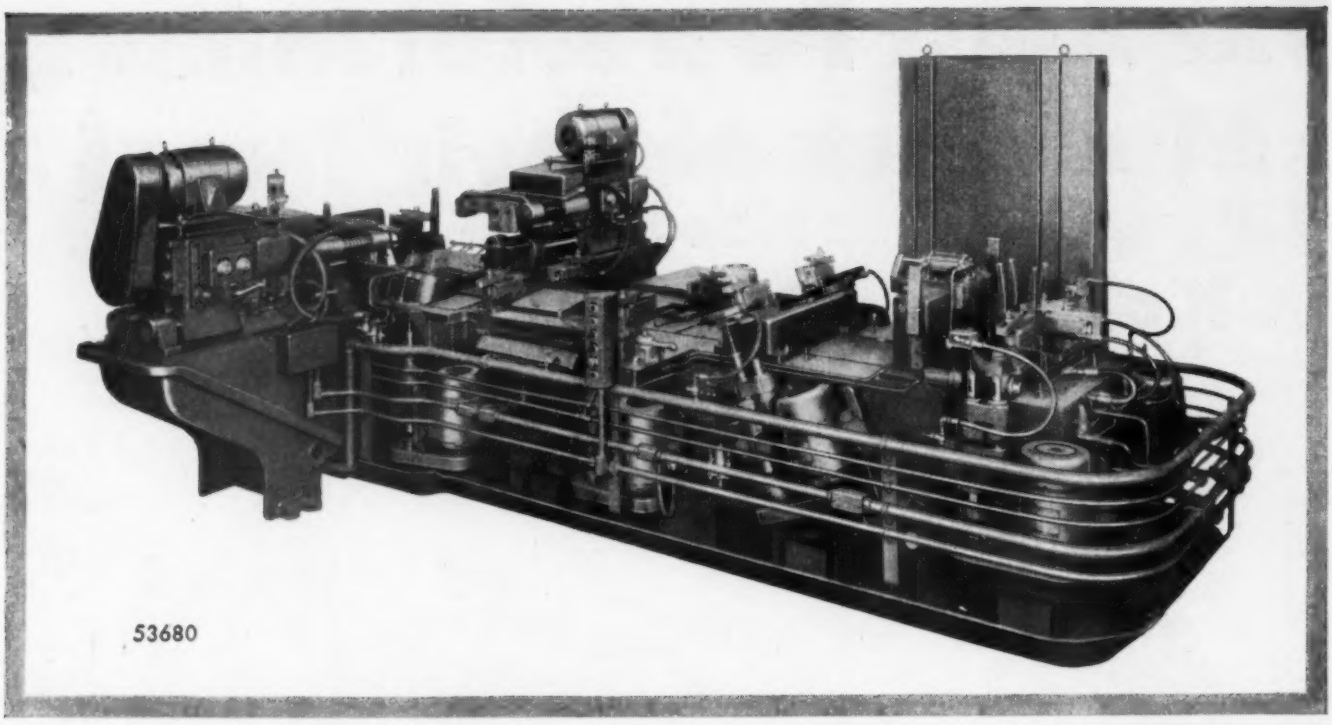
★ — exceptional ease of operation — centralized conveniently located controls.

Engineered — from the ground up — for every milling need of today and tomorrow — investigate Kearney & Trecker CSM's; write for Catalog No. CSM-20.

Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

4714

"Be ready for tomorrow . . . with CSM's!"



SNYDER SPECIAL DRILLING MACHINE IS ADJUSTABLE TO THREE SIZES OF AUTO FRAMES

Adjustability to three sizes of automobile frames is one of the outstanding features of this special-purpose machine designed and built by Snyder for drilling mounting holes for bodies, motors and spring suspensions.

The change-over from one size frame to another is made in very short time, the adjustment to longer or shorter sizes being made by moving the entire clamping bracket as well as the spindles, and positioning as is required by the individual frame.

Frames are located on equalizing clamps and are positioned and clamped by air cylinders and cam clamps. Side holes near the front are drilled with multiple heads driven from Snyder standard self-contained hydraulic units.

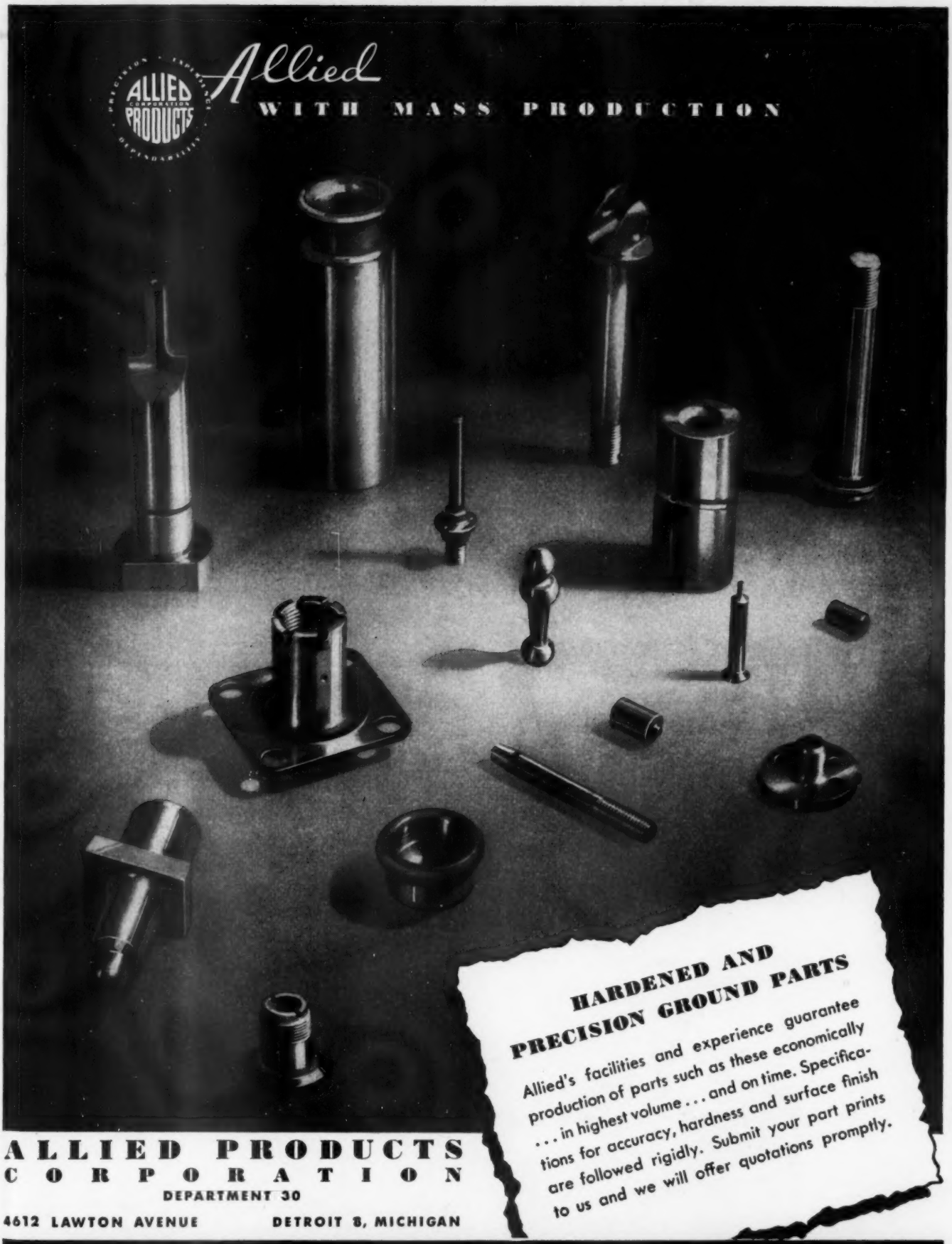
The series of vertical and angular spindles are driven from individual motors and are fed through the work by one hydraulic cylinder which actuates action pinions. This cylinder and feed mechanism is mounted on the inside of the welded steel base.

Piping for coolant, air and electric wiring is purposely kept on the outside for easy accessibility and to serve as a guard rail for operators.

The adaptability of this machine to various size parts and the saving in capital investment made possible thereby are typical of the values which Snyder engineers strive to design into Snyder special-purpose machines. Perhaps there is an opportunity in your production set-up for similar economies. *Snyder Tool and Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

21 Years of Successful Cooperation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST



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Allied's facilities and experience guarantee production of parts such as these economically ... in highest volume ... and on time. Specifications for accuracy, hardness and surface finish are followed rigidly. Submit your part prints to us and we will offer quotations promptly.

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SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

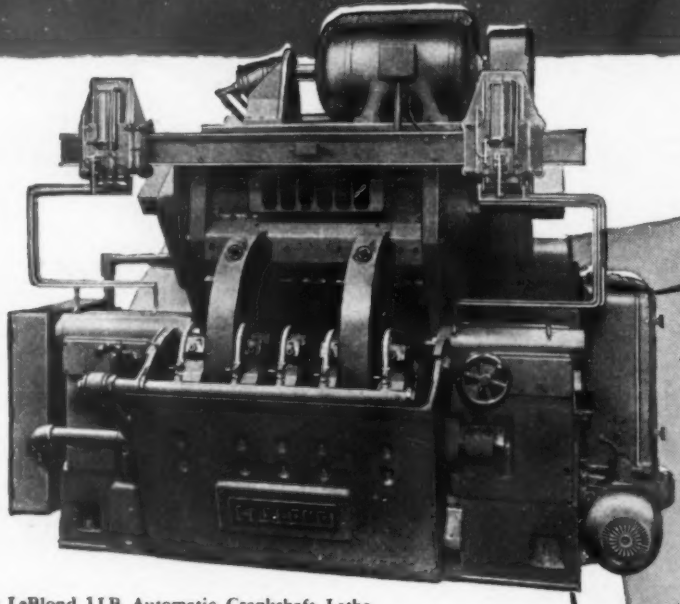
Industry's Story in...

M. F. CAMPBELL,
Peninsular Machinery Co.,
Detroit, Mich.

"One of the big LeBlond stories in Detroit is the outstanding crankshaft installation at FORD MOTOR COMPANY, Dearborn. Since the first LeBlond automatic crankshaft lathe was installed by Ford in 1940, they've bought many more. Soon they will be operating more than thirty of them and that original lathe is still doing a top job.

Ford is certainly pleased with these lathes because they combine operations formerly requiring six separate stages. LeBlond automatic crankshaft lathes turn out exacting cranks and hold them to close tolerances at every point. In addition, they are equipped with many special features which reduce floor-to-floor time and make it easy on the operator, like the double loading device on the machine shown here."

DETROIT



The LeBlond 1LB Automatic Crankshaft Lathe

These LeBlond Agents and many others . . . one of them near you . . . know metal turning as few men know it. Since they offer the largest line of lathes available from one manufacturer, the unbiased advice on the selection of a lathe for any specific use can be relied upon.

SALT LAKE CITY

J. M. GRISLEY,
Salt Lake City, Utah

"I just visited a school shop that's tooled up as efficiently as a manufacturing plant. The shop at the JORDAN HIGH SCHOOL, Sandy, Utah, under the direction of Mr. Dean J. Beck, operates 22 LeBlond Lathes and the LeBlond No. 2 Cutter Grinder in the picture here. Our boys are developing into first class machinists because they're trained right on the same types of lathes they'll operate later on their jobs. And that Cutter Grinder is teaching them the value of good sharp tools."

J. F. OWENS,
J. F. Owens Machinery Co.,
Syracuse, N. Y.

"I like this installation especially because it's in the plant of the LAMSON CORPORATION, here in Syracuse. Lamson is a company we can be proud to be associated with because quality is their watchword and they insist on the highest quality when they buy machine tools. Lamson precision is nationally known, and precision operation put this LeBlond 16" Tool Room Lathe in Lamson's tool room. That's just about the best thing you can say about any lathe."

SYRACUSE

The R. K. LE BLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

NEW YORK 6, Singer Bldg., 149 Broadway, COrtlandt 7-6621-2-3

CHICAGO 6, 20 N. Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

Put your low cost precision operations on

FOSDICK JIG BORERS

● ***IF YOU WANT*** *precision work at the most favorable cost—investigate the Fosdick Jig Borer. Consult one of our nearby representatives or write for full descriptive bulletin Fosdick Jig Bore J.B.A.*

● Right now costs are uppermost in the minds of all those responsible for the production of tools and dies.

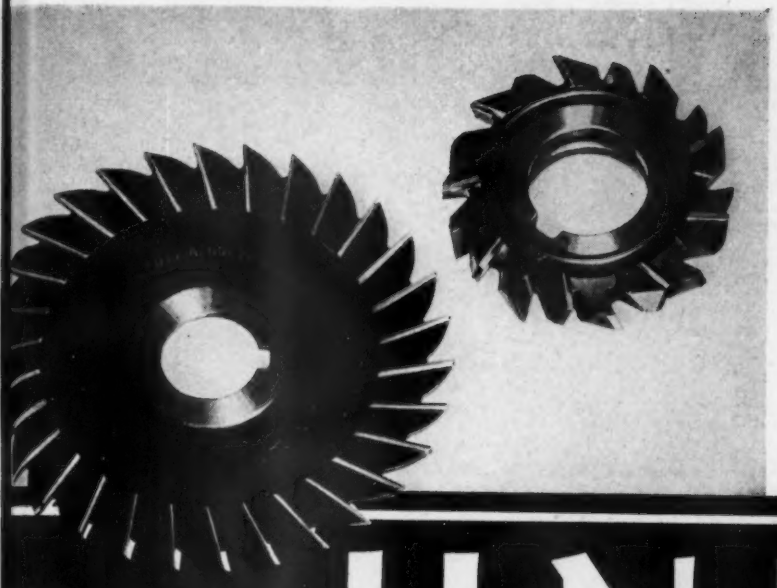
Today you are bidding on business on a profit and cost basis. Fosdick Jig Borers will help you keep jig and die cost down.

These modern jig borers offer the accuracy of much more expensive machines at a moderate initial cost. They have the rigidity that assures continued precision—versatility to handle a wide range of close tolerance operations—ease of operation that promotes maximum production on short runs at low cost.

The machine shown is typical. Here a die boring operation is being done on a Fosdick Jig Borer at the Experimental Tool & Die Company.

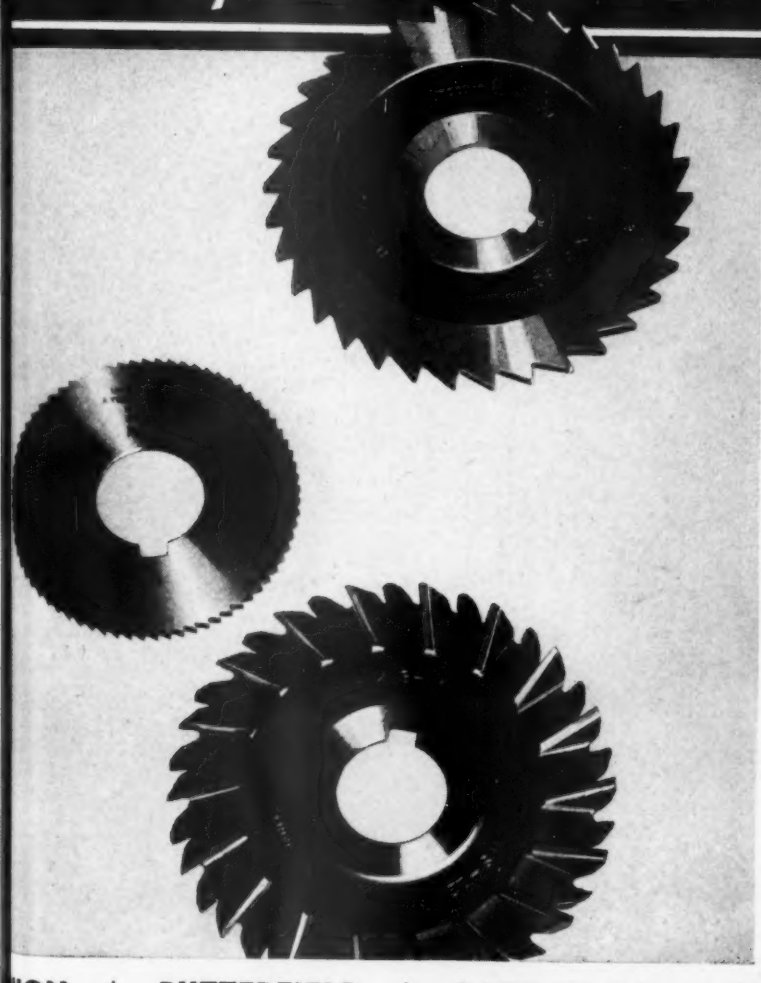
Being so highly versatile it is an excellent machine for tool rooms and tool and die shops because of its adaptability to a large number of distinctly different jobs.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ... OHIO



Particularly for Planners

...by UNION



The men who plan production have found that Union Tools fulfill their most exacting specifications for precision—plus productivity. Union Tools are designed particularly for these exacting planners . . . made to make it easier for them to stick to their schedule of production and maintain their standards of accuracy.

UNION TWIST DRILL CO.
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Chicago: 11 So. Clinton St.
Detroit: 5527 Woodward Ave.
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get CARD quality

Get Card Quality when yo order taps . . . and be sure of consistent quality results on all your tapping jobs. Card stands for Card accuracy. Card quality have been proved again and again on every type of tapping operation . . . proved by service for over 70 years!

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For results in [illegible]—in quantity or [illegible]—specify Butterfields! Typical of the complete line of Taps and Reamers for every type of job, the high production tools illustrated are designed from [illegible] to make work [illegible] accurate and economical. For the tough jobs . . . for the accurate jobs . . . for the fussy jobs—specify Butterfields!

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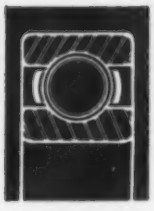
Butterfields!

2

The Single Row Ball Bearing

ITS USE AND ADVANTAGES

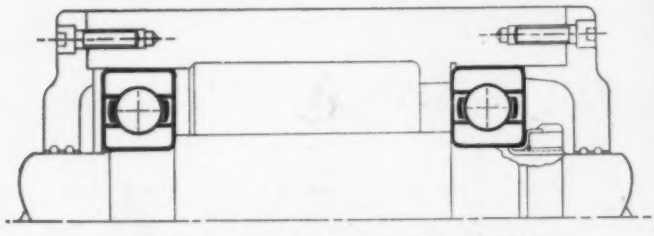
AS PRODUCED BY NORMA-HOFFMANN



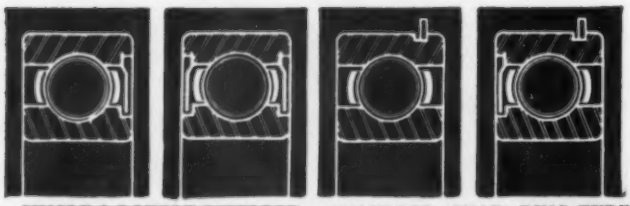
DEEP GROOVE NON-FILLING SLOT TYPE

This is the most widely used type of all anti-friction bearings. It can carry both radial and comparatively heavy thrust loads. Its uninterrupted, symmetrical raceways and self-contained, deep-groove design give it a wide range of application. Special types are available with ultra-precision tolerances. Here are some of its advantages:

- Self-contained. Can be handled and mounted as a complete unit.
- Has equal thrust capacity in either direction.
- Close conformity of raceway with ball contour provides maximum load support.
- No adjustment. Bearings delivered with required internal clearance.



- In two-bearing applications (as above) one bearing can be locked in the housing, the other "floated." This allows for expansion due to temperature changes and compensates for variables in machining shaft and housing shoulders.



SINGLE & DOUBLE SHIELDED

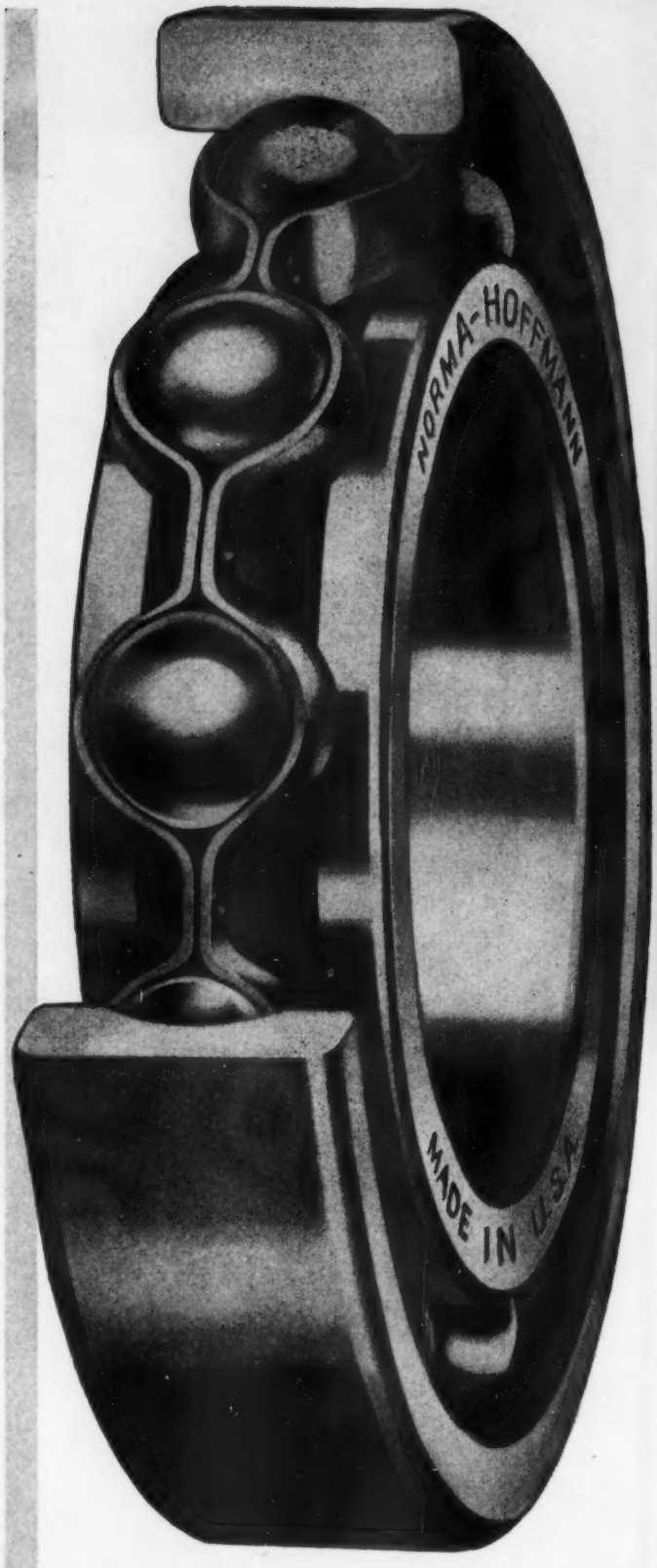
The side plates are fixed in outer ring and extend into recess of inner ring forming labyrinth to retain grease, exclude dirt.

1. Provides economical closure for many ordinary uses.
2. Supplements other seals for extra dirty applications.
3. Occupies no greater space than standard single row bearing.
4. Pre-packed with Norma "Stability-Tested" Grease; long service without relubrication is assured.

SHOULDER (SNAP) RING TYPE

This bearing is equipped with a split metal locating ring which is snapped into a groove in the outer ring of the bearing.

1. Self-locating; no need for providing machined housing shoulders.
2. Permits simplest housing: a straight through bore.
3. Provides longitudinal compactness with saving of materials and weight.



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PRECISION BALL, ROLLER AND THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD, CONNECTICUT
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Feeling a tap's pulse

Visitors to the "Greenfield" plants are amazed at the laboratory techniques that are now a part of modern threading tool and gage manufacture. Surrounded by every device for the measuring and testing of precision tools, "Greenfield" metallurgical scientists and technicians keep tabs on "Greenfield" products every step of the way from the raw stock to the finished product.

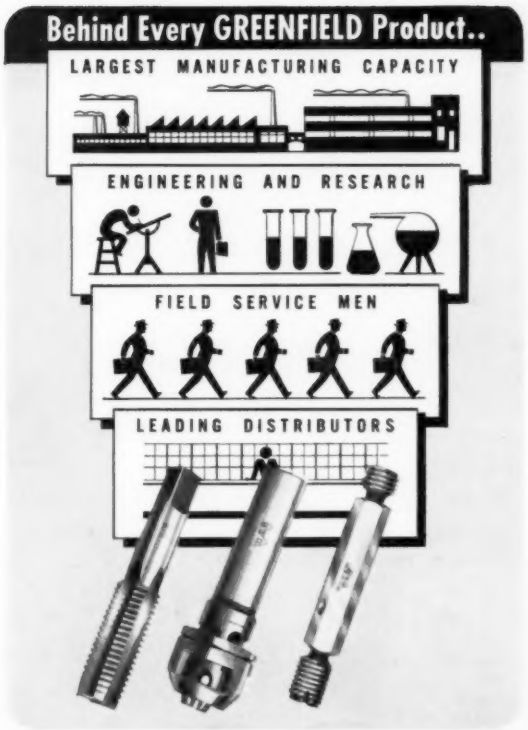
In these metallurgical "clinics," they check the chemical composition, the microstructure, the hardness, the toughness, and the wear resistance. Because of such vigilance, users of "Greenfield" tools get ***more for their money*** in threading tool performance.

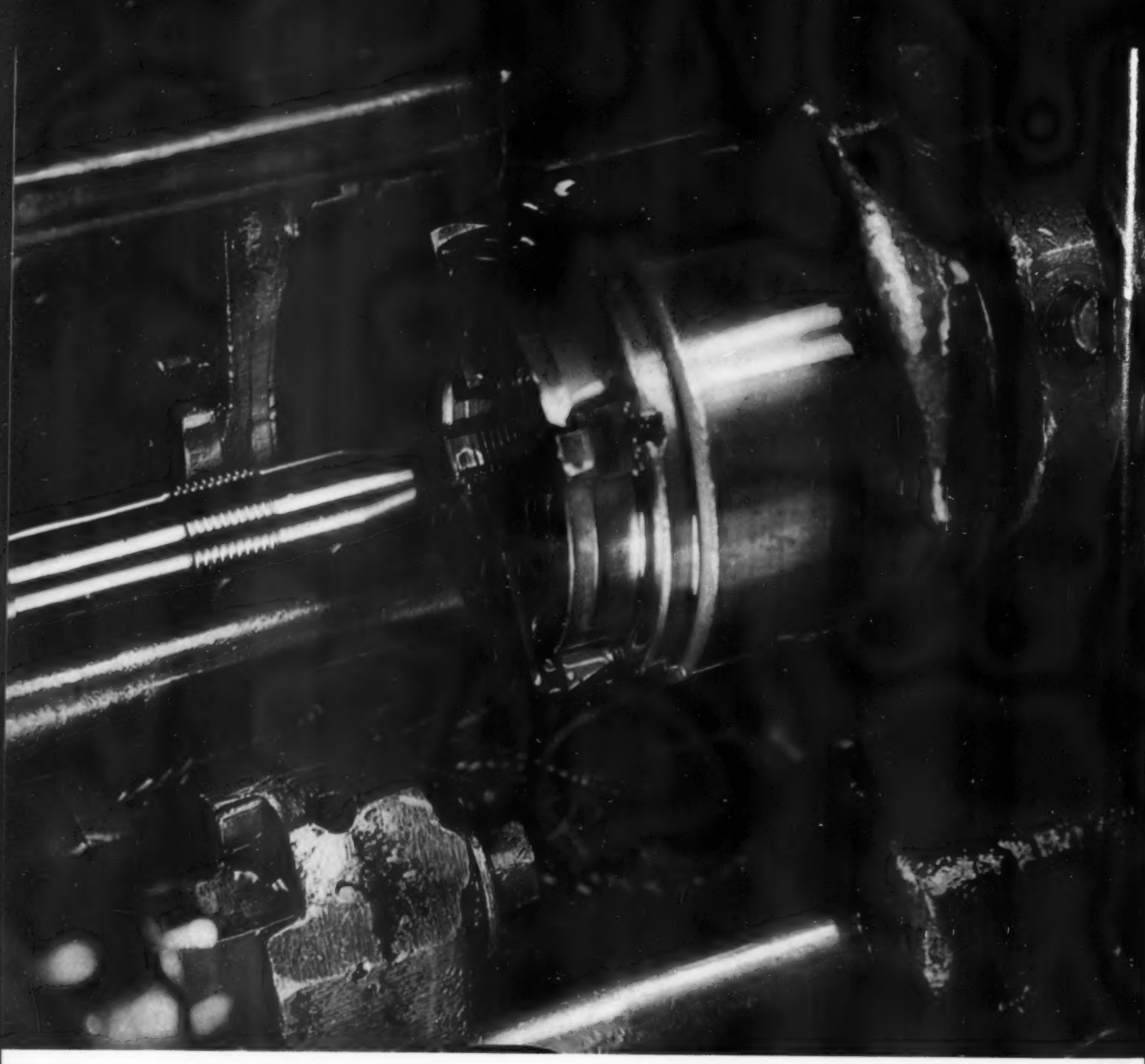
GTD GEOMETRIC

GREENFIELD

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS





A Die Head You Can Forget!

Day after day this Geometric Die Head does its job—so accurately, so automatically, so dependably that you soon forget all about it. That's the best possible compliment from thousands of users who for years have been choosing Geometric Die Heads in preference to all others. Suitable for use on most any live spindle machine, Geometric Die Heads are famous for their long-lived precision. Here this Geometric Style KD Rotary Self-Opening Die Head is cutting a $\frac{3}{4}$"-16 N. F. thread on a hollow chuck component. Note its compact and rugged design, particularly adapted to multi-spindle automatic screw machines. *Write for complete details about the "Style KD" and other Geometric Die Heads.*

FOR NEARLY EVERY THREADING JOB — A GEOMETRIC

If you have in mind a particular threading problem, we will be glad to have our engineers give you their recommendations, based on over a half century of specialization in this field. Why not let us send you the latest Geometric catalog?

THE
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TOOL COMPANY . . NEW HAVEN 15, CONN.

A Division of Greenfield Tap and Die Corporation

FOR TODAY'S TOUGHER JOBS, HERE'S A NEW TOUGHER MOTOR

WHERE IT'S WET Wet weather doesn't bother the new totally-enclosed Tri-Clad motor. Neither do frequent "washdowns" in food plants.

WHERE IT'S CORROSIVE Acids, alkalis, and fumes are kept out of these new Tri-Clads. Cast-iron enclosures are corrosion-resistant, extra strong.

WHERE IT'S DIRTY Dirt and dust can't get into these Tri-Clads to shorten their life. Smooth surfaces are convenient to clean.

WHERE IRON DUST FLIES Harmful iron dust and metal filings can't get past the inner wall. Bearings are protected from dust.

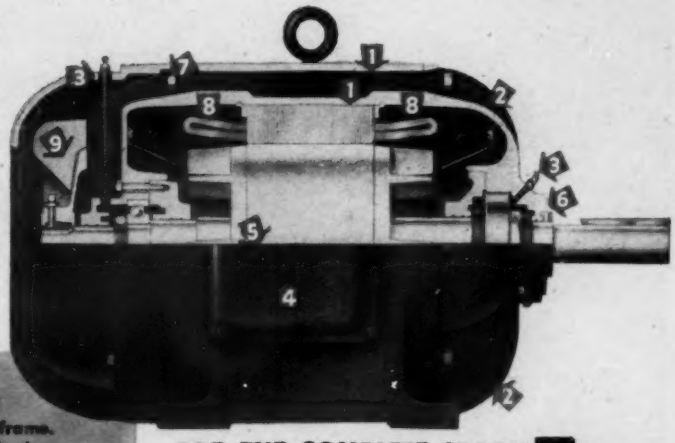
WHERE QUARTERS ARE CLOSE When space is limited for a totally enclosed motor, you'll like these trim, compact new Tri-Clads.

WHERE EXPLOSION HAZARDS EXIST The new Tri-Clad motors are available in explosion-proof constructions where needed.

THE G-E *TRI-CLAD* TOTALLY ENCLOSED MOTOR

(1 TO 1000 HP)

In 1940 you welcomed the Tri-Clad open motor with it's *extra protection features*. More Tri-Clads have since gone into service than any other integral-horsepower motor. Now G.E. is ready with a new line of tough, totally enclosed Tri-Clad motors for use in adverse atmospheres. *We believe they are industry's most dependable motors*. Their longer life and lower maintenance will make them a sound investment on almost every job. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.



10-POINT PROTECTION

1. A cast-iron, double-wall frame completely encloses and protects the windings and punchings.
2. Corrosion-resistant cast-iron end shields are machined to provide a tight seal, and protect the motor from dust, dirt, and moisture. Primer and finish coat of Glyptal* varnish affords high rust-resistance.
3. A pressure-relief greasing system, which can be packed with long-life lubricant, protects the bearings.
4. The cast-iron conduit box is diagonally split for easy wiring. Boxes are independently explosion-proof on Class I motors.
5. Nonshrinking compound around motor leads protects motor interiors from dust and moisture at the point where leads pass through the frame.
6. Rotating labyrinth seal further protects motor interior from damage by foreign matter.
7. Large air passages provide adequate protection from overheating. They're easy to keep clean and open, too.
8. Modern, "ageless" insulation treatment includes windings of *Formex magnet wire.
9. The powerful external fan is removable to simplify maintenance; nonsparking type in explosion-proof motors.
10. Individual dynamic balance of rotors and external fans protects against vibration hazards, even under severe operating conditions.

*Trade-mark Reg. U. S. Pat. Off.

FOR THE COMPLETE STORY

Apparatus Department, Section 750-278C
General Electric Company
Schenectady 5, N. Y.

☐ Please send me GEA-4400, which describes the new Tri-Clad totally enclosed motors.

☐ Please send me GEA-4131, "Motors and Control for Hazardous Locations."

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GENERAL ELECTRIC

HOW TO GET BETTER SMALL GEARS

GO to a *specialist* when you want the best. Whether it's surgery or Small Gears, that same principle applies. When you come to G.S. with Small Gear problems you employ the services of highly skilled craftsmen . . an organization of *specialists* who have concentrated upon the quantity production of better Fractional Horsepower Gears *exclusively* for more than twenty-five years! Here, every conceivable facility is maintained at peak efficiency for doing a better job at low cost. G.S. engineers will lend you valuable aid if you'll just ask for it! Submit *your* problem today or write for the new G.S. folder.

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GEAR Specialties

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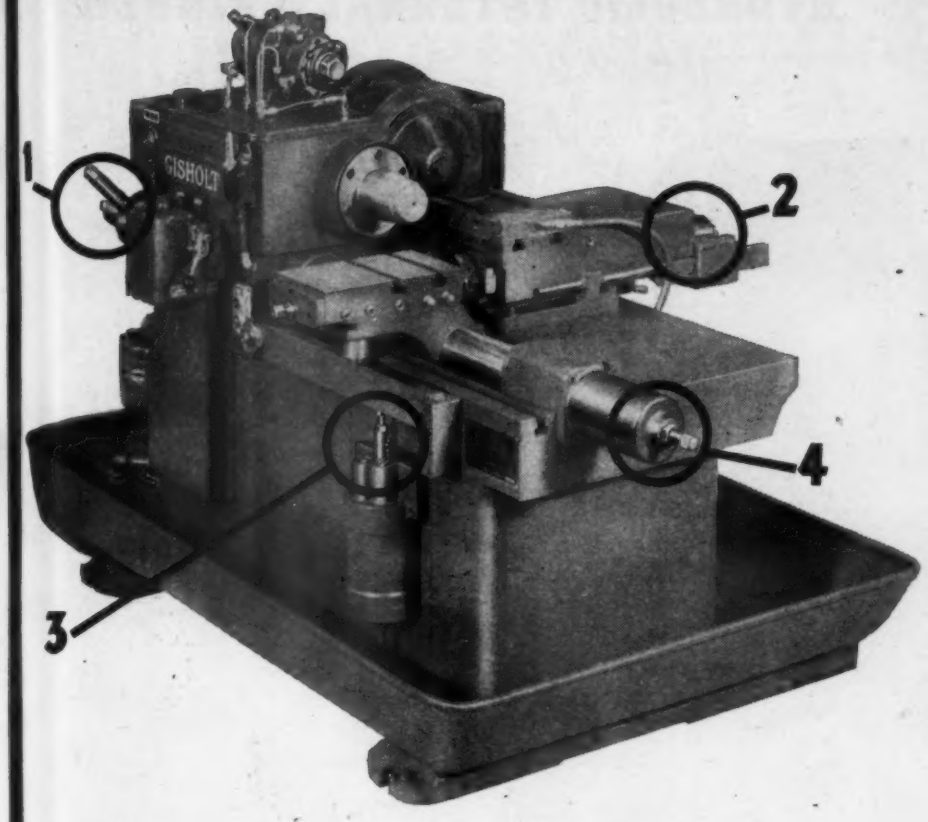
how modern
HYDRAULICS
simplify set-up and adjustment

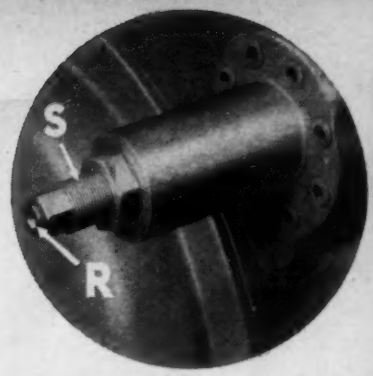


the Gisholt Hydraulic Automatic Lathe

Here's an automatic lathe that's *different—simpler—more adaptable* ...thanks to the advanced application of hydraulics. Here's the ability to handle a wider variety of work. With a front carriage which alone will perform a dozen or more different combinations of longitudinal and transverse motions, you can always obtain the most favorable tooling arrangements.

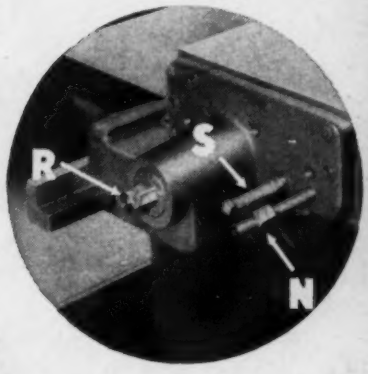
Set-up and adjustment is easier, without the usual mechanical complications. There are no drums or cams, no adjustments within the bed of the machine. For example, all such machine functions as rapid traverse, feed engagement, feed stops, and rapid traverse to end of cycle position, are easily controlled by simple, accessible adjustments, as shown here.

Easy adjustment insures better, more accurate work. Speed gives you more of it. Write for full information about the Gisholt Hydraulic Automatic Lathe.



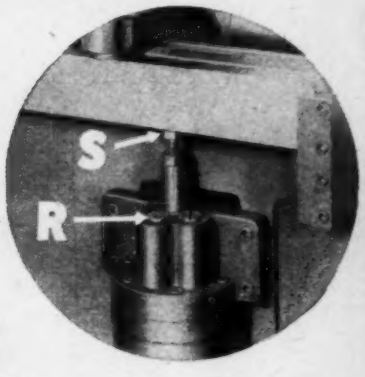
1

R—Traverse-to-work stop and feed engagement.
S—Feed stop for front carriage.



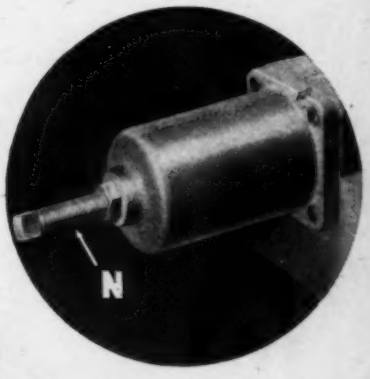
2

R—Forward traverse-to-work stop and feed engagement for rear slide.
S—Micrometer screw feed stop for rear slide.
N—End-of-cycle return traverse stop for rear slide.



3

R—Traverse-to-work stop and feed engagement for transverse movement of front carriage.
S—Feed stop adjustment for in-feed of front carriage.



4

N—End-of-cycle return traverse stop for front carriage.

GISHOLT MACHINE COMPANY

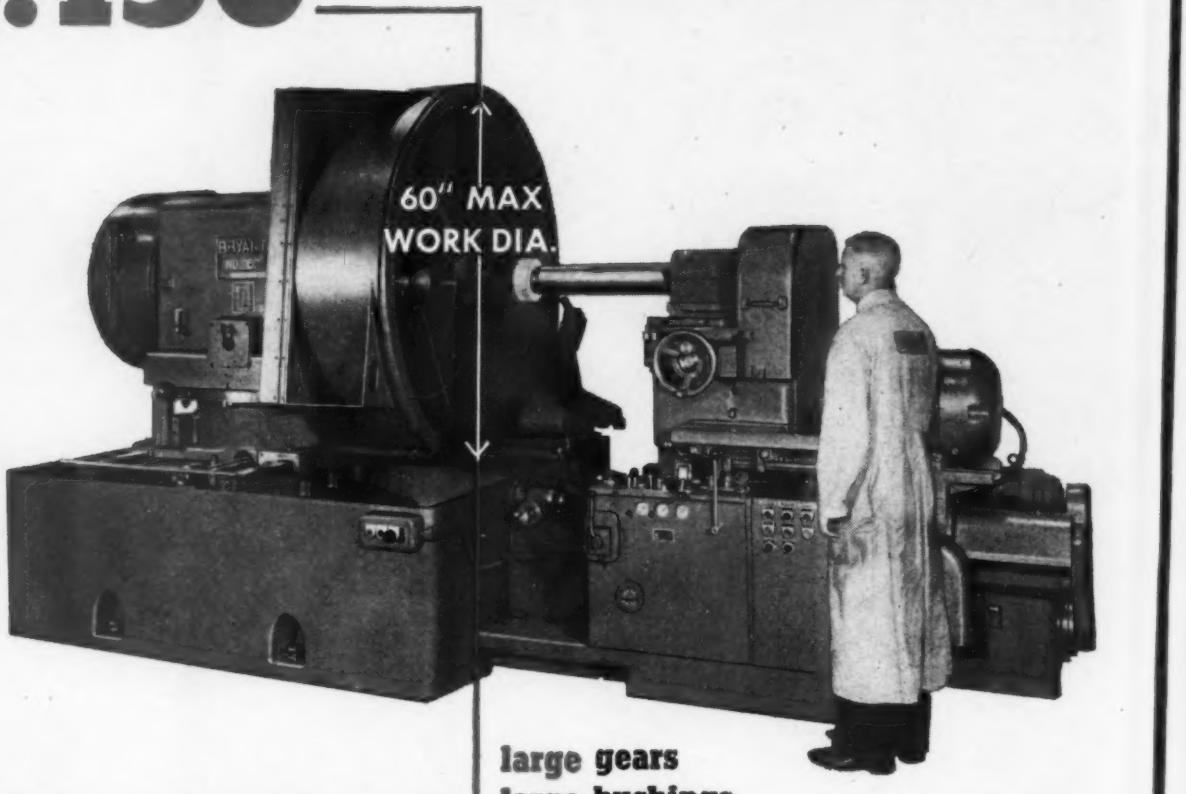
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead... Keep Ahead... with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

NEW No. 150 HYDRAULIC INTERNAL GRINDER



Another Bryant Postwar Development for

large gears
large bushings
large bearings
large dies, etc.

The new No. 150 grinder is a great Bryant postwar achievement to vastly increase the internal grinding capacity of your plant. This big machine is easily controlled and produces the finest finish on gears, bushings, castings, etc., *up to 60" in diameter.* The many functional features of the new No. 150 assure extremely accurate work on a high production basis. The famous Bryant three point wheel slide suspension is basic and closely maintains wheel alignment at all times. A preloaded anti-friction cross-slide insures smooth hand and power cross feed, and a hydraulically retractable wheel slide simplifies the loading and unloading of parts. The work spindle is designed for the mounting of work fixtures on either end, and is hollow to facilitate the chucking of special spindles or long work.

In a single chucking, the new No. 150 can grind a bore, or a bore and face—the bore may be either straight or tapered. When grinding a face and straight bore the new No. 150 is particularly advantageous because it assures maintenance of squareness between bore and face. Outside diameters, or outside diameters and faces can also be finished in one chucking. A copy of the new catalog sheet giving full details is yours for the asking.

If you have internal grinding work in the range from 1/16 inch diameter bore to 60" diameter swing, Bryant has machines that will economically meet your requirements. It will pay you to—

Send for the man from Bryant.

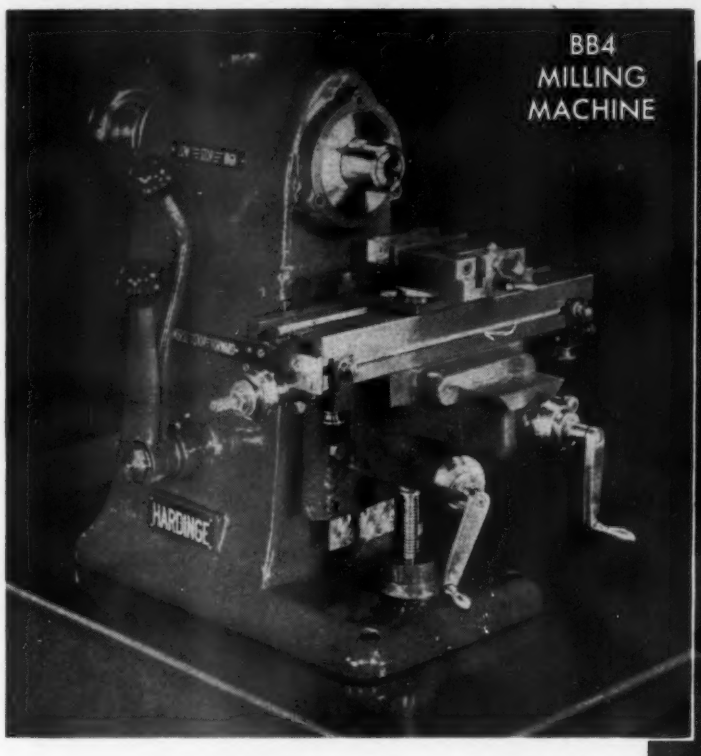
BRYANT

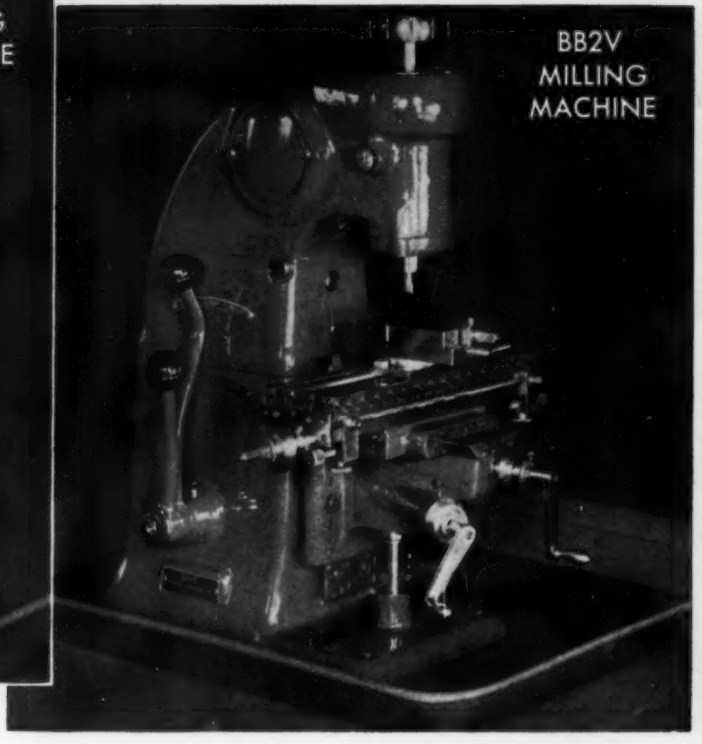
BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION MILLING MACHINES

Provide Greater Economy for Small Parts





Vertical or Horizontal—any way you look at it—closer proportion in the size of the machine tool to the size of the work means greater efficiency.

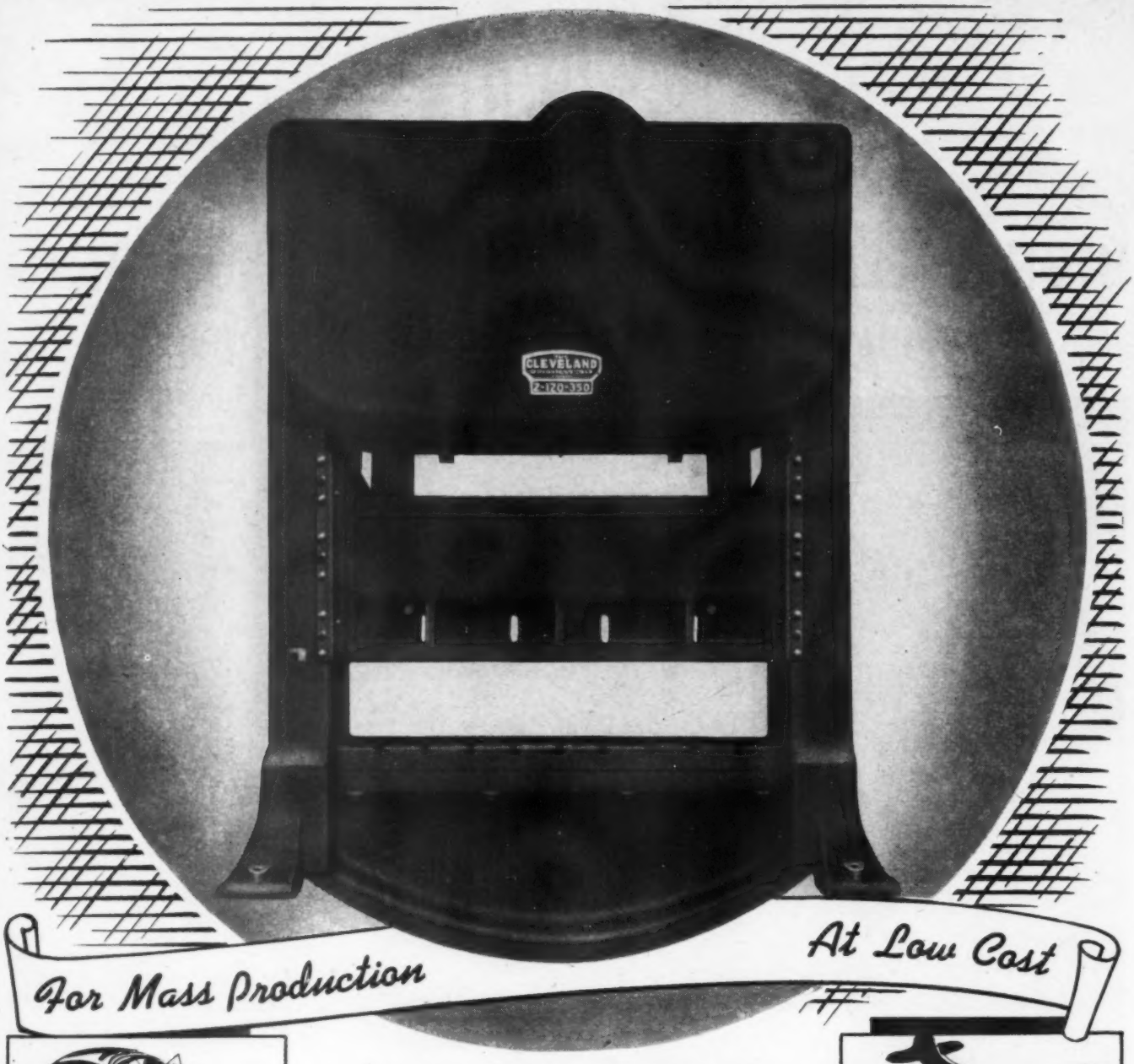
HARDINGE Precision Milling Machines are small, compact and designed to do a volume job on small parts. For a low, original investment, the HARDINGE Milling Machines can release large equipment that is really too cumbersome for small work . . . and parts manufacturing costs can be reduced.

Utilize the advantages of HARDINGE Precision Milling Machines for small-size work in production, tool room and development departments. Write us today for counsel in the application of HARDINGE Precision Milling Machines to your work.

Table size, both machines, 12" x 3 3/16". BB4 has ¾" collet capacity, eight speeds to 3000 r.p.m. BB2V has ½" collet capacity, eight speeds to 5000 r.p.m.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



For Mass Production *At Low Cost*

AUTOMOBILES

STOVES

WASHING MACHINES

MODERN
CLEVELAND PRESSES

Single Point, Two Point and Four Point are built to conform to modern engineering standards of design and construction, and embody greater strength and ruggedness with greatly reduced weight.

Furthermore, modern design permits of many improvements in operating efficiency . . . gears completely enclosed, running in a bath of oil . . . short shafts eliminate undue torsional strain . . . sensitive and safe air and hydraulically operated clutches, electrically controlled . . . slides counterbalanced by air . . . these, and many more recent developments contribute not only to continuous operation but also to a better and more uniform product.

Manufacturers who are expanding or replacing their Power Press equipment will find it advantageous to install Modern Cleveland Presses because Cleveland Presses embody all the features which assure long life, dependability, accuracy and profitable production.

AIRPLANES

REFRIGERATORS

OFFICE EQUIPMENT

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, O.*

New York · Chicago · Detroit · Philadelphia · Pittsburgh

READY-MADE

HALLOWELL

SHOP EQUIPMENT of STEEL

TO SUIT YOUR NEEDS

No fuss with workbench designs of your own . . . no need for your building workbenches, because with about 1300 **ready-made** interchangeable combinations available in "Hallowell" benches of steel, you are sure of finding just what you want. "Hallowell" benches are built sturdily and strongly too, for "lifetimes of wear". They are so firm that they stand rigid without costly bolting to the floor. Of outstanding quality, they are an asset to any shop.

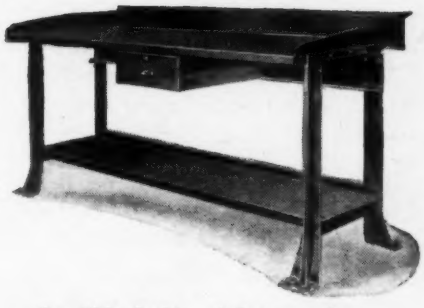


Fig. 732—Pat'd and Pats. pending. Drawer is extra

Write today for the free "Hallowell" Catalog of Shop Equipment.
"Unbrako" and "Hallowell" products are sold entirely through distributors.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

THEY'LL DO A SUPERIOR JOB *for You . . .*

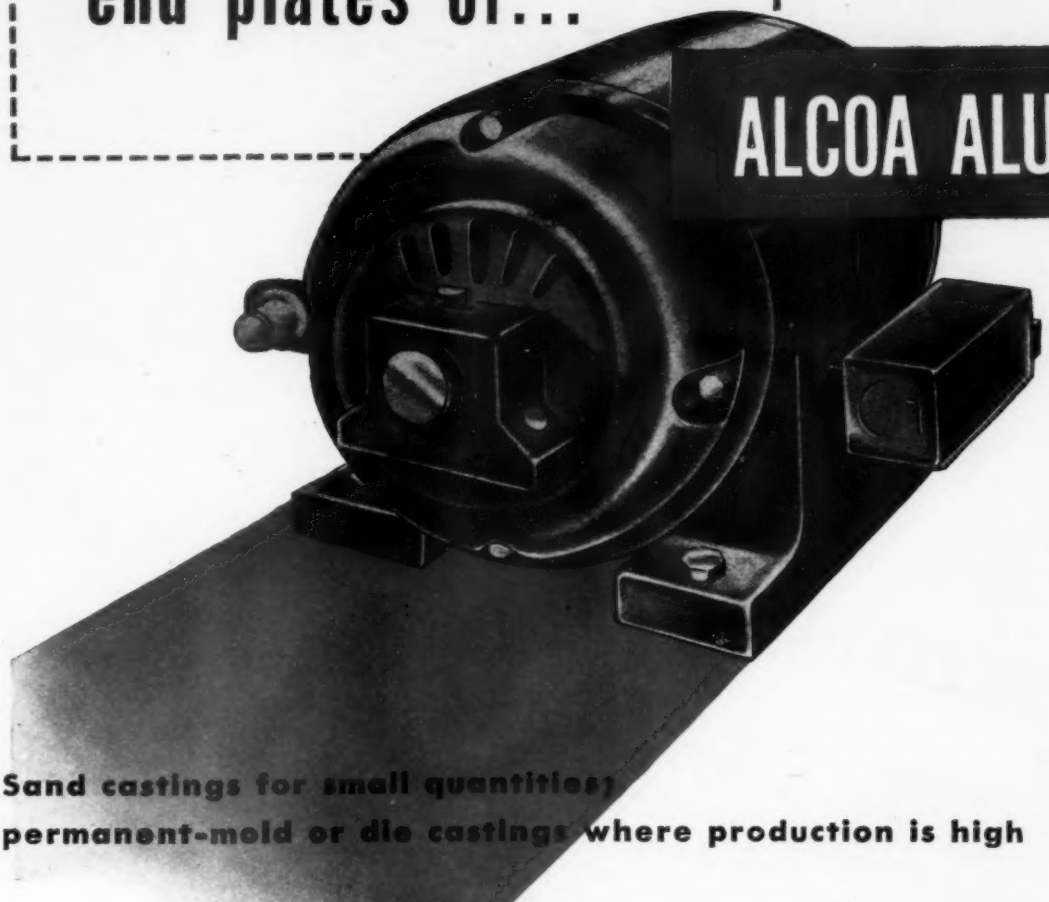
★ Just as they are helping to boost production and cut costs in thousands of plants, GORHAM tools will do the same FOR YOU. The tougher your problem, the more reason to choose GORHAM cutting tools for assured results. ★ ★ ★ GORHAM High Speed Steel Tool Bits are being used successfully on dozens of new applications . . . perhaps on jobs identically like yours. Plants large and small are daily discovering the many points of GORHAM superiority: Why not YOU? ★ ★ ★ Our long experience in the selection and heat treating of metals makes it possible to produce bits that meet your most exacting requirements. Try them today: You'll specify GORHAM for all your future cutting tool needs.

GORHAM TOOL COMPANY
14400 Woodrow Wilson
Detroit 3, Mich.

Gorham
HIGH SPEED STEEL
TOOL *Bits*

Make those motor end plates of...

ALCOA ALUMINUM



Sand castings for small quantities; permanent-mold or die castings where production is high

Consider what Alcoa Aluminum end plate castings will do for your motor production—permanent-mold and die castings for volume production, sand castings where quantities of any one model are small.

Little excess metal need be left on Alcoa permanent-mold and die castings, since dimensions can be held to close limits. Machining time and costs are consequently much less. Surfaces are smooth, taking a fine finish with a minimum of preparation.

In addition, you reduce the over-all weight of electric motors by making their end plates of aluminum. A four-pound saving on a ⅓ H.P. motor is typical. This means easier handling all along the line, and lower shipping costs.

Check on the use of Alcoa Aluminum by calling the nearby Alcoa office.

Or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

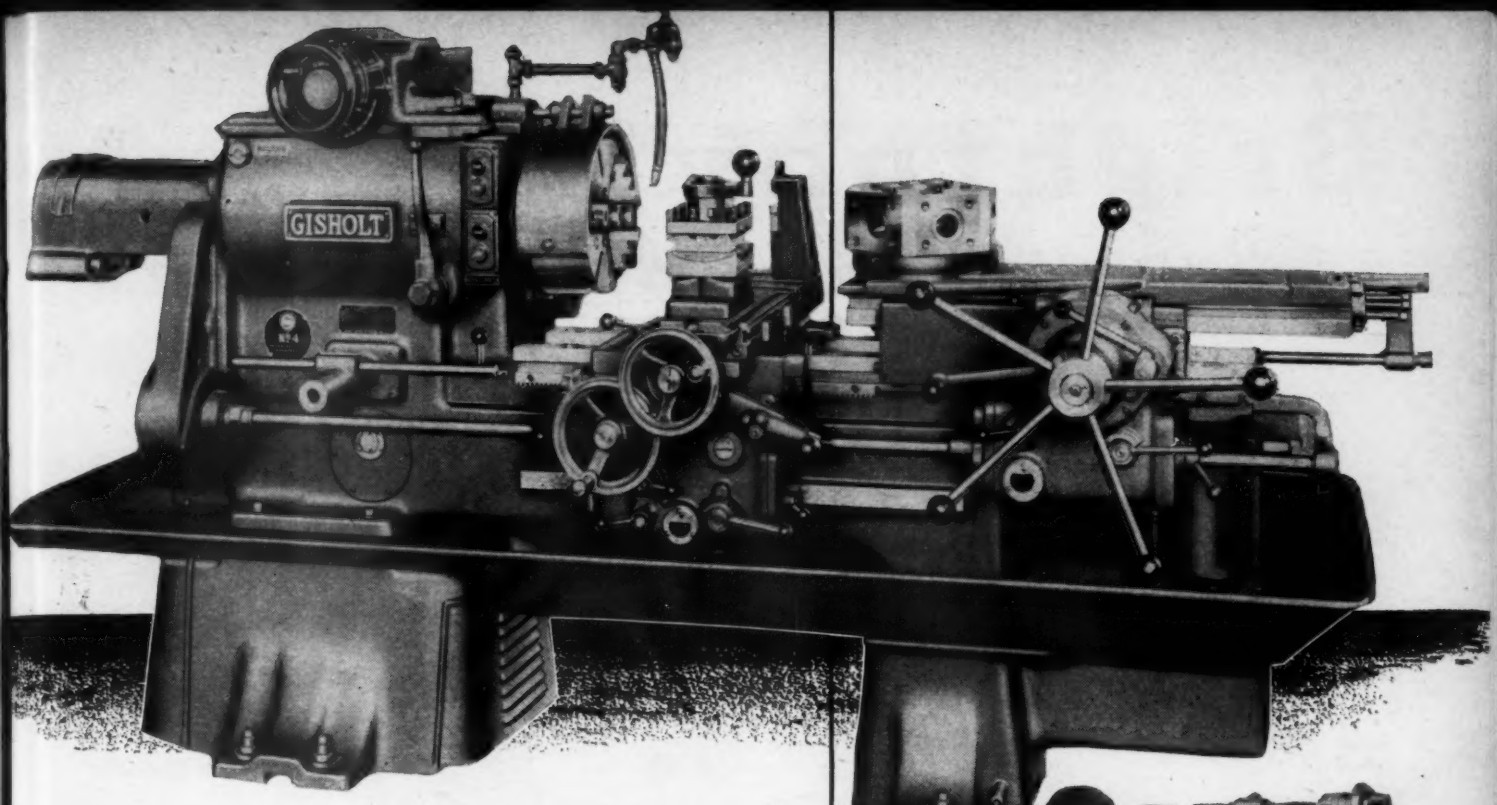
ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

IT PAYS TO FERTILIZE A FACTORY FLOOR!

With the world's population doubling in the next eighty years we would face famine if we had to depend on animal fertilizer and composte. Fortunately with the special tools of the process industries we are making phosphates from rock, and nitrates from gases. Thus we shall double production from the world's tillable farm floor space. There is also a sure way to fertilize a factory floor and get double production from it. Have special production tools designed and built by a firm that has been doing it superlatively since 1915.

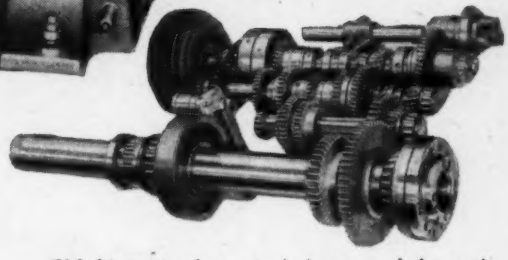
ENGINEERING • PROCESSING • DESIGNING • BUILDING
SPECIAL TOOL AND MACHINERY MANUFACTURING



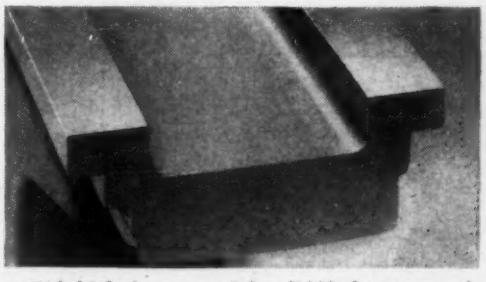
PRECISION *built* or PRECISION *work*

ou can't expect (or get) accurate work from a machine ol unless accuracy is first built into the machine itself. r many years this basic truth has guided the building of sholt Turret Lathes. Snug, precisely fitted parts to elim- te vibration . . . ample bearing surfaces to prevent "play" careful selection of steels to preserve tolerances . . . proper rication to prevent wear—these are the qualities that ure lasting accuracy.

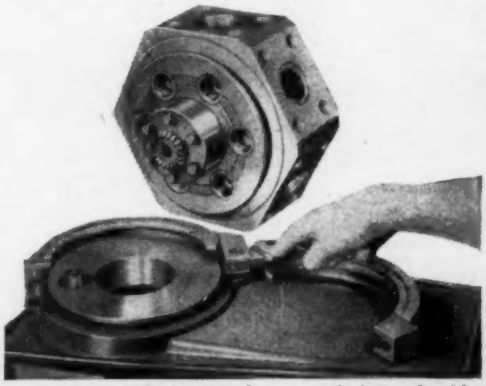
Wherever an improvement in design or construction uld contribute to greater accuracy and longer life, it has en made, without stint. That is why experienced users ve confidence in Gisholt accuracy—why you'll so often ar them say, "Do the job right. Put it on a Gisholt!"



Gisholt's 12 speed gear train is a marvel of smooth power transmission. All gears are of heat treated and oil hardened alloy steel with ground tooth form.



Gisholt's bed ways are of the solid block type, ground in place to perfect alignment with the spindle, and hardened to 64-66 Rockwell "C".



Accurate indexing of the turret is insured with hardened and ground locating pin and bushings. This most powerful turret clamp known gives one-piece solidity to the locked turret.

ISHOLT MACHINE COMPANY

l East Washington Avenue • Madison 3, Wisconsin

ok Ahead . . . Keep Ahead . . . with Gisholt

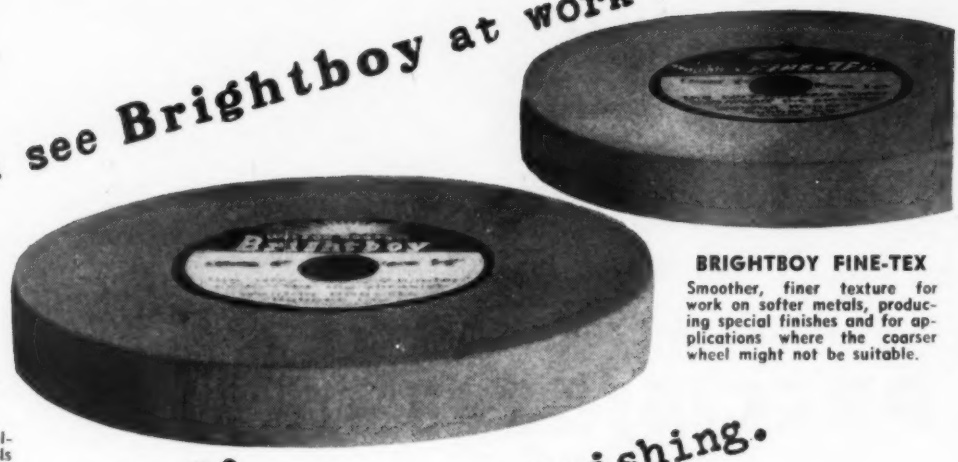
GISHOLT

URRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Brightboy

Rubber WORKS WITH *Abrasive*
to—CUT OPERATION STEPS
REDUCE 'REJECTS'
IMPROVE SURFACE FINISH AND QUALITY

As soon as you see Brightboy at work



BRIGHTBOY FINE-TEX
Smoother, finer texture for work on softer metals, producing special finishes and for applications where the coarser wheel might not be suitable.

BRIGHTBOY STANDARD
Favorite for burring, finishing and polishing on the widest variety of metals and metal parts.

You'll recognize:

An unprecedented type of abrasive finishing.
You'll appreciate the simultaneous
BURRING - FINISHING - POLISHING
action of rubber and abrasive.
You'll think of many work-saving
Brightboy applications in the
manufacture of metal, wood and
plastic products.

BRIGHTBOY TUFF-TEX
Tougher texture, for finishing hard metals. The tougher binder accents the abrasive action, yet retains the soft rubber cushion, finishing and pre-polishing in one operation.

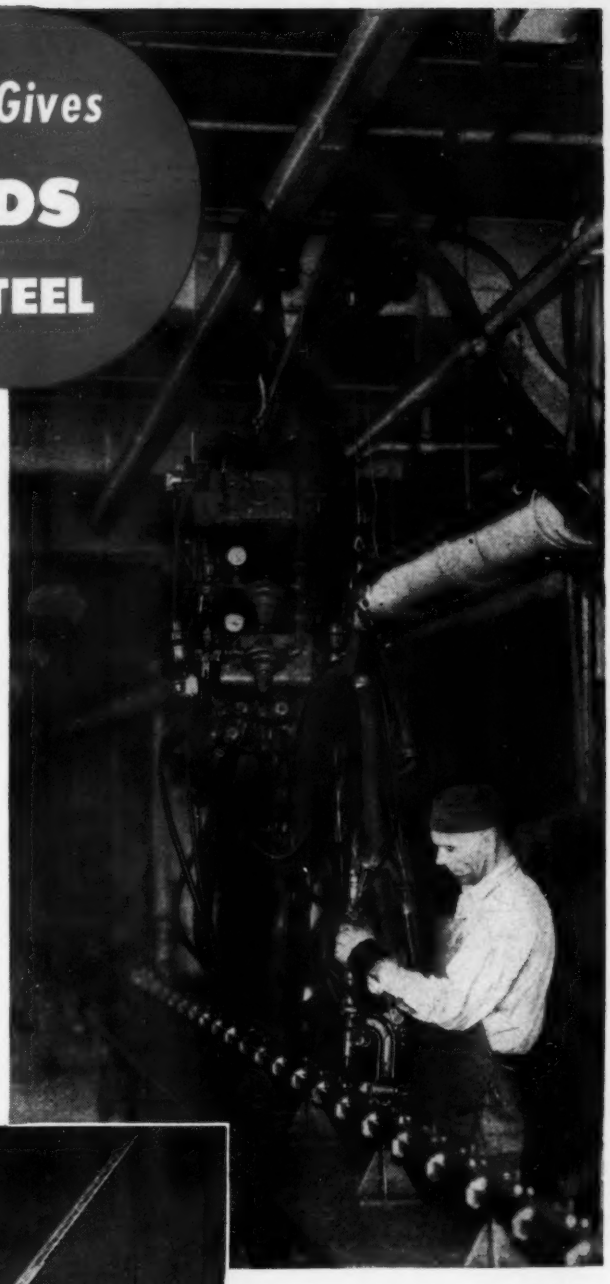
WELDON ROBERTS
Brightboy *for*

"One operation" bridging of production steps between the grind and the buff.
Removing: Tool & Weld Marks, Digs, Coatings & Paint.
FOR ALL PHASES OF CLOSE-TOLERANCE FINISHING BY HAND OR MACHINE

Ask your dealer for Brightboy methods and applications data, prices and catalog. Ask to have a Brightboy service representative call for specific-procedure recommendations.

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co., Newark 7, N.J.

New Tempering Attachment Gives STRONGER WELDS IN AIR-HARDENABLE STEEL



●Fire-fighting ladders of low-alloy steel are now being spot-welded by a new method at the American-La France-Foamite Corporation, Elmira, N. Y. The welding machines are equipped with G-E synchronous electronic control and a new G-E tempering attachment.

HEAT TREATING ELIMINATES BRITTLENESS

To meet exacting strength requirements, these lightweight ladders must have tough, ductile welds. Such welds cannot be made in air-hardenable steel by normal methods because chilling effects of the water-cooled electrodes would cause the weld nugget to be brittle. And the weld, as a result, would be weak.

Use of the tempering attachment, by which the work is heat treated without removing it from the welding machine, makes possible consistently strong welds.

HOW IT'S DONE

The weld is made in the normal manner. When its temperature has dropped to approximately 200 to 300 degrees above room temperature, current is passed through again. Adjustment of this current, which differs in both time and magnitude from that used in the welding, is provided by the tempering attachment.

The additional heating, or tempering, materially increases the toughness and ductility of the weld.

FOR ADDITIONAL FACTS

Wherever medium-carbon, low-alloy, or high-alloy steels must be joined, spot welders with G-E tempering control will give a product of maximum strength. For further details about this control, get in touch with your resistance-welder manufacturer or our nearest office. Ask for our Bulletin GEA-4201. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

● ● ●

In this strength test, the American-La France-Foamite 100-foot, all-steel fire-fighting ladder supports weights totalling 3,200 pounds at an angle of 60 degrees.

● ● ●

Ladder sections are welded on this specially designed welding machine, which is suspended from an overhead monorail and moves the length of the ladder side rail.

● ● ●

RESISTANCE WELDING CONTROL

8960

GENERAL ELECTRIC

CUSHMAN CHUCKS

A World Standard for Precision

Here are some of the reasons why!

Pinions of hardened special analysis steel with tooth form processed to provide accurate alignment with the scroll gear.

Chuck bodies engineered to assure solidity, stiffness and jaw support and alignment without excess weight. Mounting faces precision machined.

Counter bore recess of bodies finished to extreme accuracy to guarantee correct alignment when mounted. Pratt & Whitney Electrolimit gages are used for testing these dimensions for Chucks designed for American Standard Type A-1, Cam Lock Type D-1 or Long Taper Key Drive Type E mountings.

Face of master jaws hardened and ground after assembly in chuck to provide accuracy in alignment of special top jaws. Cross key slot finished to American Standard tolerances providing accurate location of top jaws.

Scrolls of self centering chucks are cut on our own specially designed machines after heat treatment. This method insures precision lead of scroll thread and toughness to withstand chucking stresses.

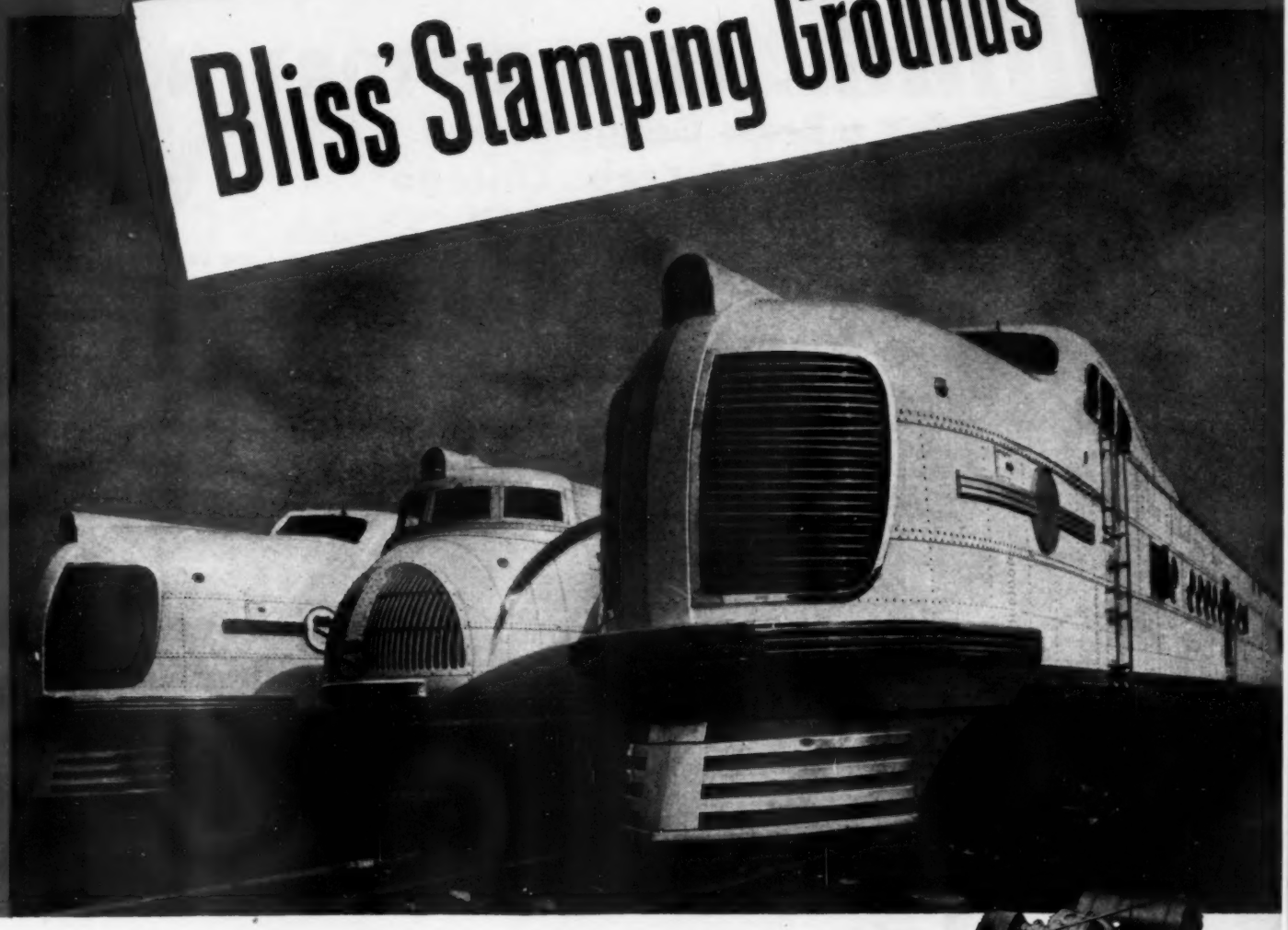
Accuracy of finished chucks tested and held to within .003" total indicator error. Chuck bodies dynamically and statically balanced.

THE CUSHMAN CHUCK CO., HARTFORD 2, CONN.

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

Bliss' Stamping Grounds



BLISS PRESSES are very much at home "working on the railroad," streamlining the new iron horses and their glistening rows of stainless steel cars or blanking out main beams for freight cars and box car ends.

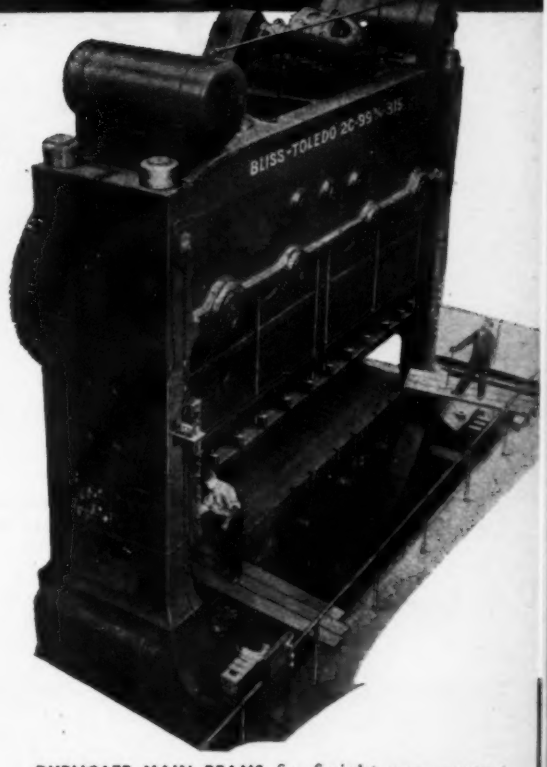
And they don't stop there. You'll see pressed metal objects all through the train—blanked, formed or drawn on large and small Bliss equipment. The stove, refrigerator, sink and pots and pans in the kitchen, the lighting fixtures and cutlery in the diner...even the finger bowl. And after taking note of the heating and ventilating units, stroll up front to the engine cab. Here, too, the throttle, generating equipment and control panels started out in Bliss presses, to say nothing of the many forgings which can be fabricated on Bliss Hydraulic Presses.

It takes a wide range of press sizes, both mechanical and hydraulic, to produce such an array of products. That's why we call this "Bliss' Stamping Grounds."

At Bliss, the merging of press-building "know-how" and advanced engineering techniques has kept pace with pressed metal needs for 90 years. It's yours to put to work.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

WORKS AT: Brooklyn, Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France • SALES OFFICES: Detroit; Brooklyn; Cleveland, Dayton, Toledo, Ohio; Lansing, Mich.; Chicago; Philadelphia; Rochester; New Haven; Boston; Toronto



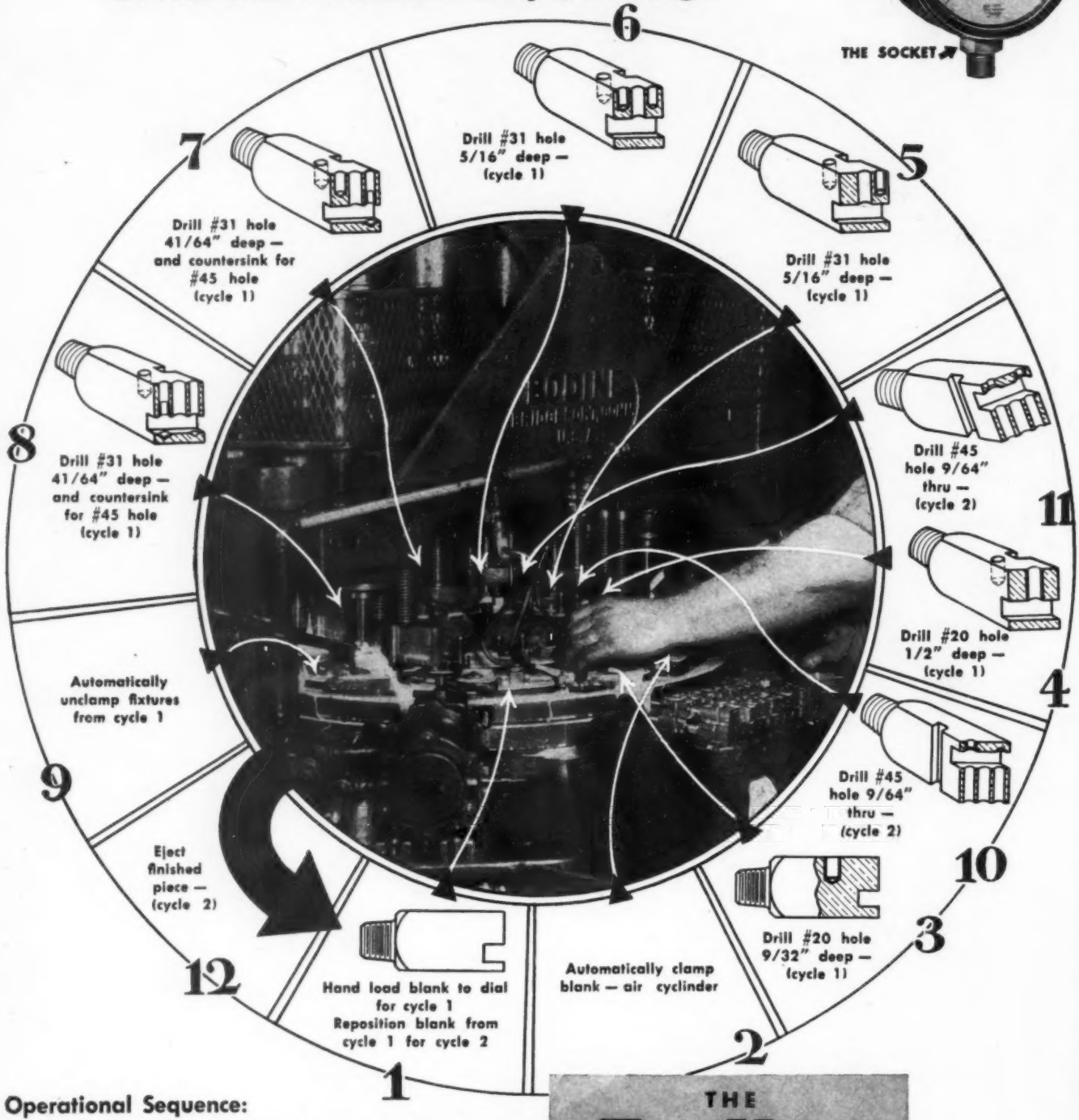
DUPLICATE MAIN BEAMS for freight cars every 10 seconds is the job of this 2500-ton Bliss single action, two crank, rail press...one of the largest presses ever built.

STAY AHEAD WITH *Bliss*

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY

Bodine...CASE HISTORY No. 19

Processing a Brass Gauge Socket at the Jas. P. Marsh Corp., Chicago


6
Drill #31 hole 5/16" deep — (cycle 1)
5
Drill #31 hole 5/16" deep — (cycle 1)
11
Drill #45 hole 9/64" thru — (cycle 2)
4
Drill #20 hole 1/2" deep — (cycle 1)
10
Drill #45 hole 9/64" thru — (cycle 2)
3
Drill #20 hole 9/32" deep — (cycle 1)
2
Automatically clamp blank — air cyclinder
1
Hand load blank to dial for cycle 1 Reposition blank from cycle 1 for cycle 2
12
Eject finished piece — (cycle 2)
9
Automatically unclamp fixtures from cycle 1
8
Drill #31 hole 41/64" deep — and countersink for #45 hole (cycle 1)
7
Drill #31 hole 41/64" deep — and countersink for #45 hole (cycle 1)

Operational Sequence:

This Bodine set-up employs 8 spindles. The part is repositioned in the dial for a second pass (cycle 2) under the spindles to complete all operations.

Production:

One piece is completed per stroke of the machine, 700 pieces per 50 minute hour . . . a total of 5600 operations. Maybe YOU can use a Bodine to reduce production costs.

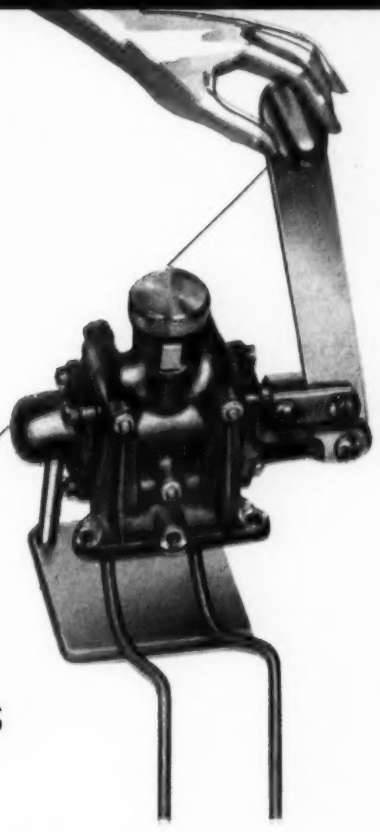
THE **Bodine** CORPORATION
BRIDGEPORT 8, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

DESIGNED FOR MARINE USE, THIS

Hydraulic Remote Control

is built with *Rustless* Anaconda Metals



The principle of hydraulic remote control is not new. Its efficiency and simplicity have been amply demonstrated in large military aircraft.

Applying this principle to marine applications, the Marine Equipment Division of Ellinwood Industries in Los Angeles has developed a compact, automatically compensated, positive remote control unit that will transmit 500 inch-pounds of torque through an angular displacement of 60 degrees, with the "master" control and operating "slave" as much as 150 feet apart—both coordinated to a thousandth of an inch! Thus, a simple solution is offered for the problem of remote regulation of throttles, clutches, governors, valves and similar primary controls.

Now, take a look at the components of the dual master control unit illustrated on the following page. Each part is made of a strong, tough, durable copper alloy and, with the exception of the red brass castings, all are Anaconda Metals. Copper, yellow brass, free-cutting brass, phosphor bronze and Tobin Bronze*. *Each* contributes its special physical properties to a specific purpose . . . *all* are rustless, corrosion-resistant, sea-going metals, products of The American Brass Company—for years, Industry's principal supplier of copper and copper base alloys.

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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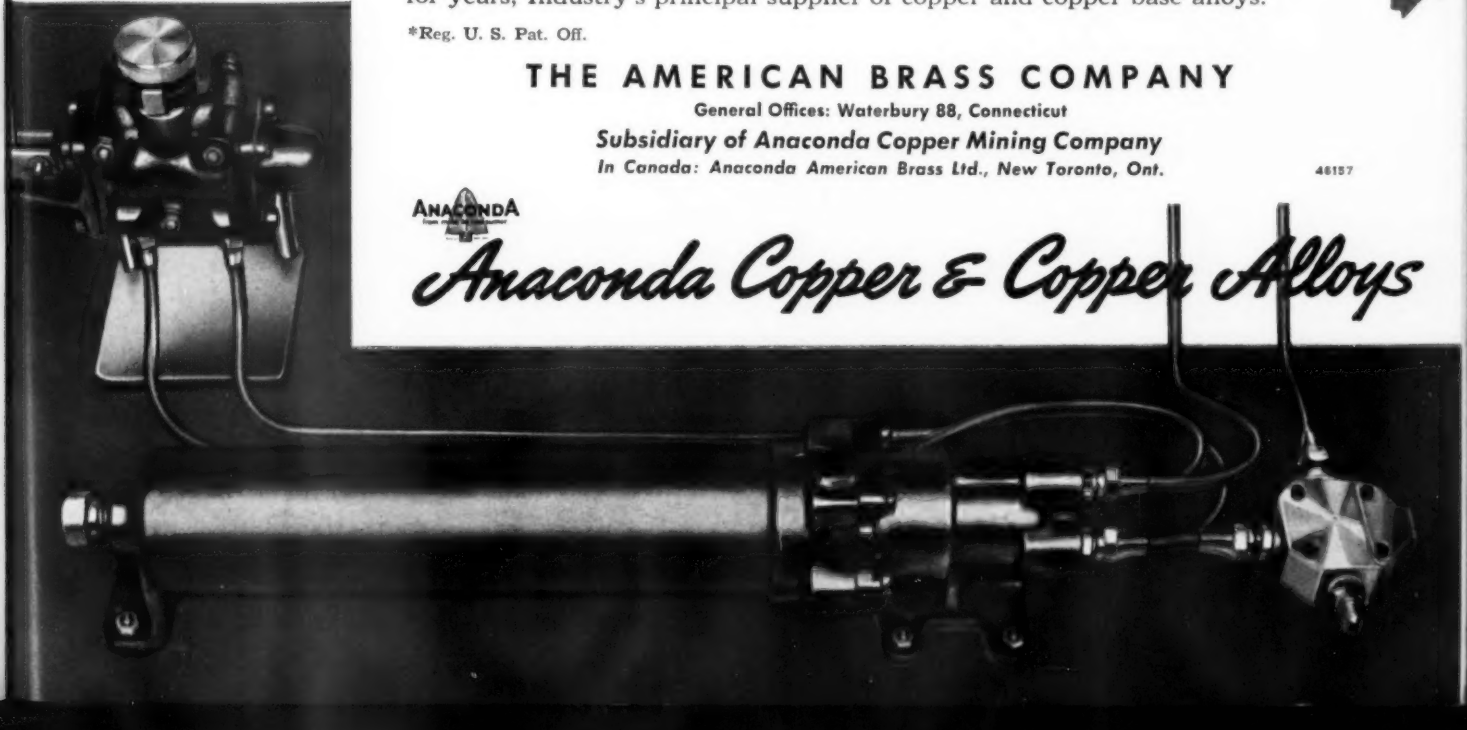
ANACONDA

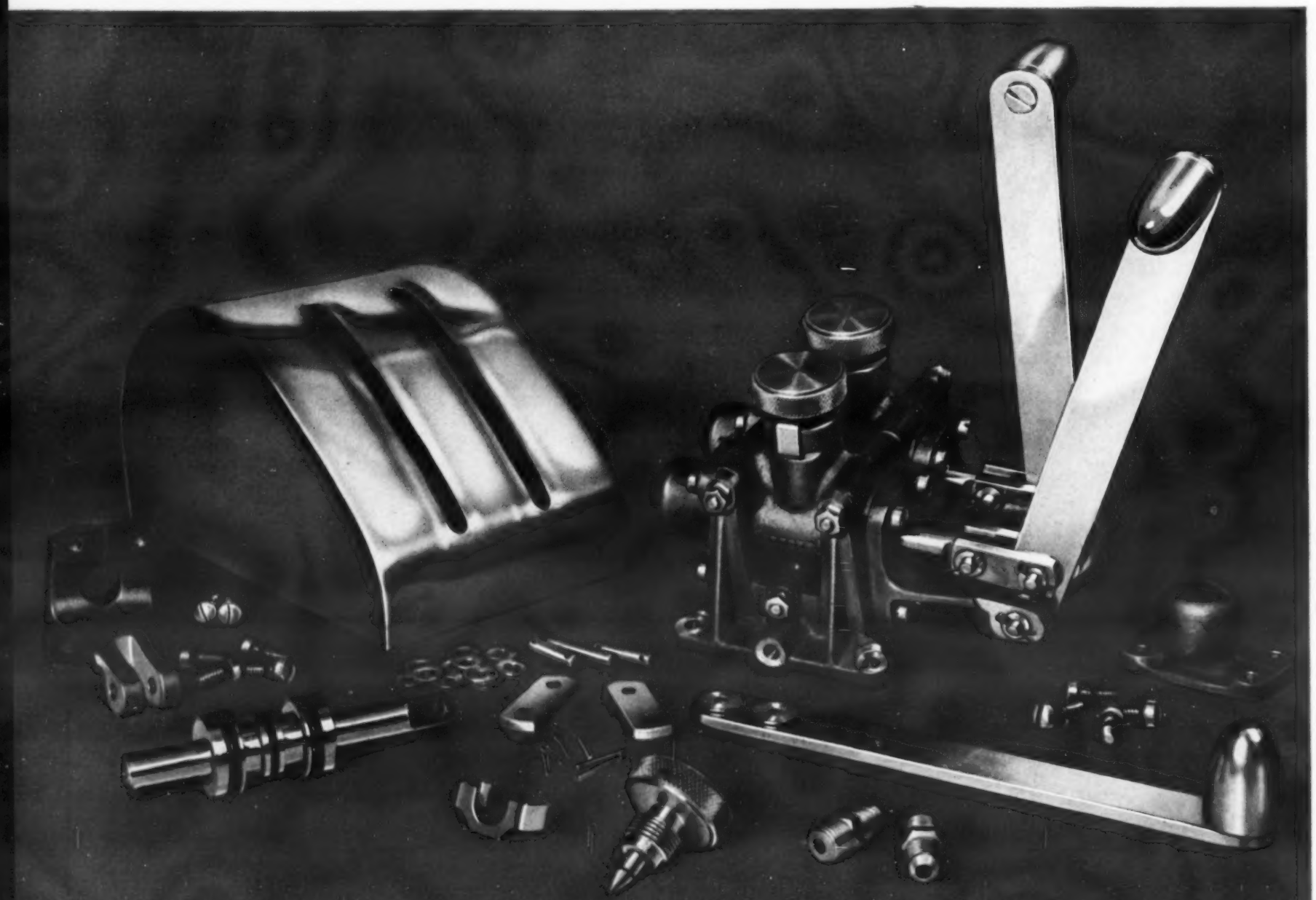
Anaconda Copper & Copper Alloys



ANACONDA
from mine to consumer
REG U.S. PAT. OFF.

ANACONDA COPPER ALLOYS

extensively used in constructing the *Ellinwood* Marine Control



Sheet Brass Housing, chromium plated

Brass Screws, Washers and Cotter Pins

Tobin Bronze* Shaft and Piston, chromium plated

Phosphor Bronze Tension Spring

Free Cutting Brass Screw Machine Parts

Tobin Bronze Lever and Turned Brass Handle, chromium plated

Tobin Bronze Needle Valve

Tobin Bronze Pins and Links, chromium plated

*Reg. U.S. Pat. Off.

THE AMERICAN BRASS COMPANY

General Offices:
Waterbury 88, Connecticut

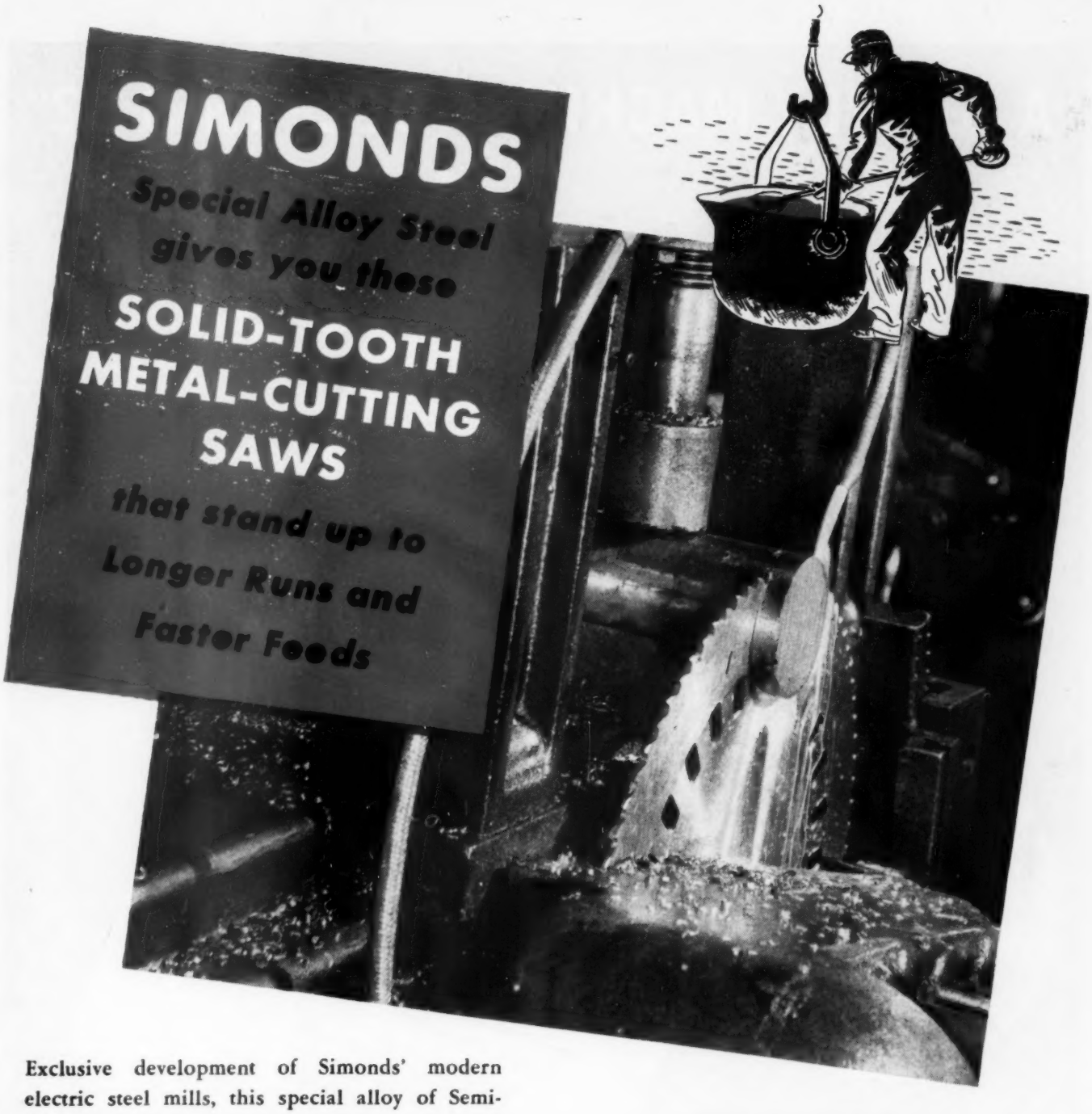
ANACONDA COPPER ALLOYS

SIMONDS

Special Alloy Steel gives you these

SOLID-TOOTH METAL-CUTTING SAWS

that stand up to Longer Runs and Faster Feeds



Exclusive development of Simonds' modern electric steel mills, this special alloy of Semi-High-Speed Steel gives you longer runs at faster feeds . . . on a wide range of work from mild steel and cold-rolled shafting to high-speed and chrome nickel steels.

Another exclusive Simonds process is the method of grinding side-clearance . . . a method which produces Solid Circular Saws with uniformly accurate rim-thickness. Then the saws are finished by still another special process which leaves no hammer-marks on the plate.

These exclusive advantages are *your triple warranty* of longer life and plus-performance in Simonds Solid-Tooth Circular Metal-Cutting Saws. Order them from your Industrial Supply Distributor or from the nearest Simonds office.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS STEEL MILLS — SIMONDS SAW AND STEEL CO. — LOCKPORT, N.Y. — *Special Electric Furnace Steels*

SIMONDS ABRASIVE CO. — PHILADELPHIA, PA. — *Grinding Wheels and Grains*

SIMONDS CANADA SAW CO. LTD. — MONTREAL TORONTO VANCOUVER SAINT JOHN, N.B. — *Simonds Products for Canada*

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S.W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

A STURDY MACHINE TOOL—THIS 32" Sidney Lathe

16 Speed continuous tooth herringbone geared headstock.

Center bearing on spindle and intermediate shaft.

48 changes of feeds from .003" to .207" per revolution of spindle.

48 changes of threads from 3/4 to 46 per inch.

Force feed lubrication to headstock—apron mechanism—carriage and bottom slide.

Anti-friction bearings throughout.

Twin disc driving clutch and brake.

Separate drive for lead screw and feed rod.

Safety interlock for feed and lead screw engagements.

Independent snap lever serrated tooth clutches for longitudinal and cross feeds.

Four wall, anti-friction, dust and chip proof gear box.

All gears and shafts of alloy steel, heat treated and accurately machined.

Hardened, ground and graduated tailstock barrel accurately fitted in honed bore.

These are a few of the many modern construction features that speak for themselves in actual production. Bulletins on all sizes available.

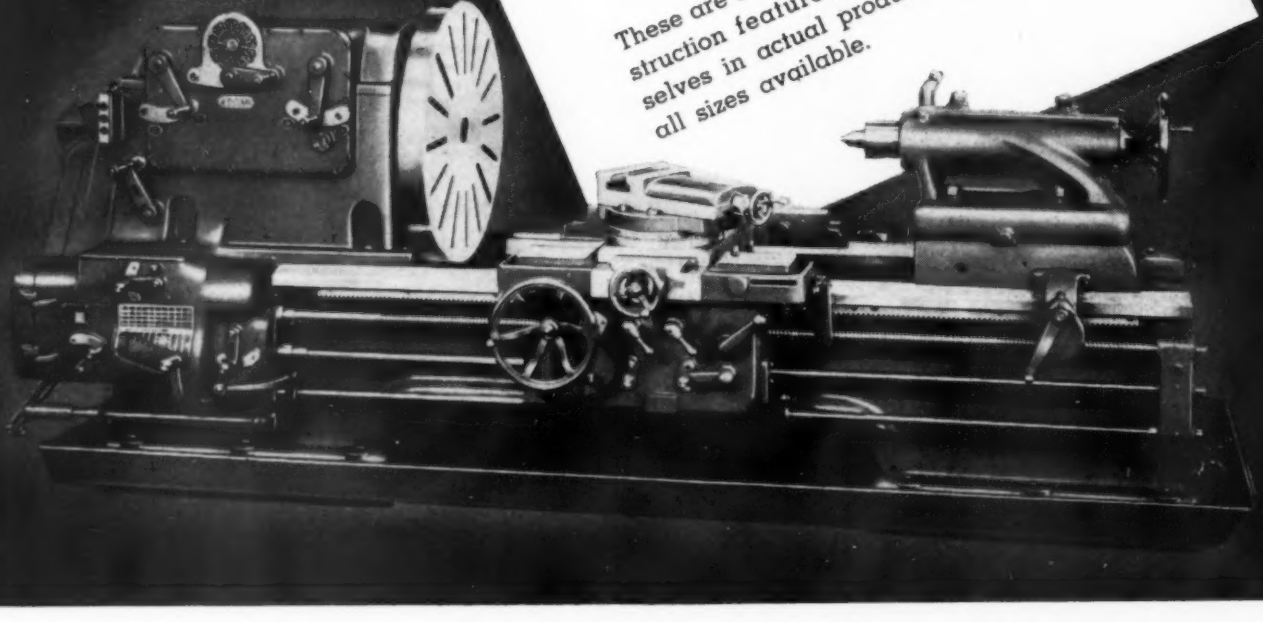
Builders of Precision Machinery

THE SIDNEY MACHINE TOOL COMPANY

SIDNEY • OHIO

SIDNEY

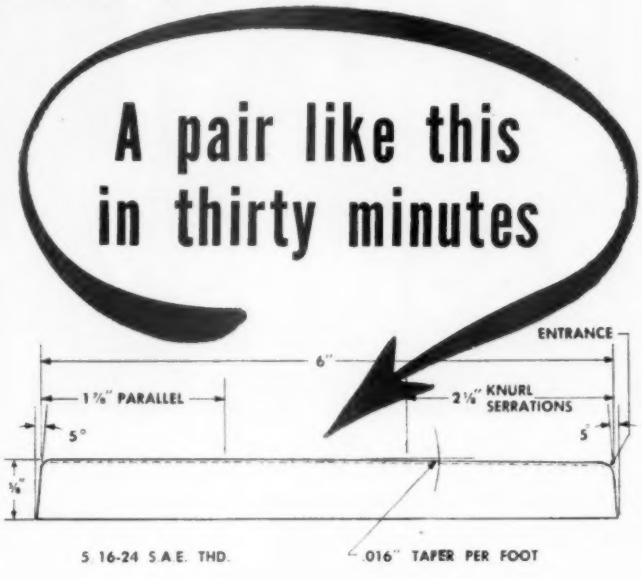
ESTABLISHED 1904



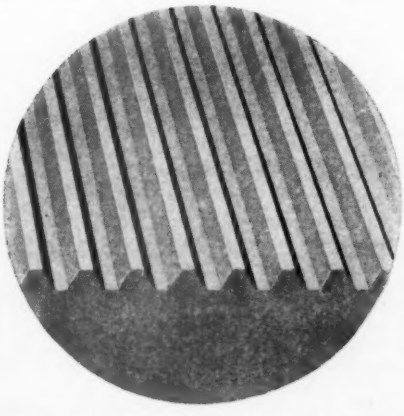
GRIND thread rolling dies?

...*the answer is* **YES!**

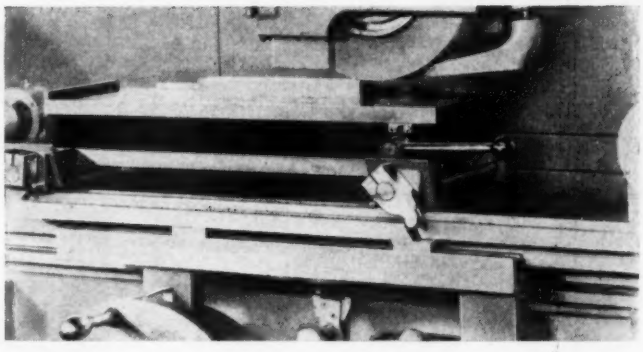
Now—through a new application of THOMPSON TRUFORMING—you can produce accurate duplicate roll thread dies and eliminate subsequent corrective operations formerly required. An example is the roll thread die shown here.



This is the Stationary Die (a perfect mate to the Moving Die not shown). Both were ground on a THOMPSON TRUFORM grinder from heat-treated alloy steel in less than thirty minutes. Note the radii, the precise taper and flat section. This is produced with a single cut—to full depth of thread form without resetting.



Enlarged tooth section shows form of threads and helix angle. By TRUFORMING dies are perfectly matched . . . there is no distortion.



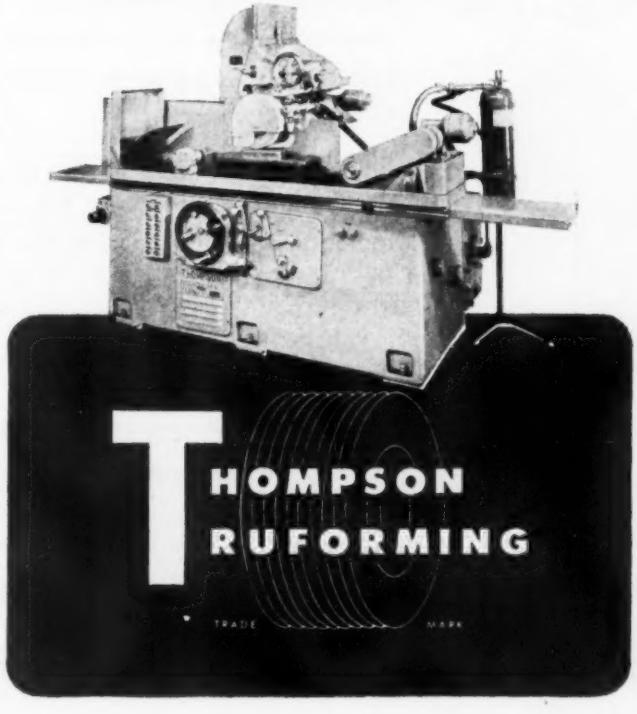
Deformities are eliminated by TRUFORMING because work is finished right in hardened steel. Note the special forming fixture in the photograph, which makes possible completely automatic and highly accurate grinding of the longitudinal contour. These Thompson die grinding features are new with patents applied for.

Longer die life and greater die accuracy, plus ability to regrind dies without drawing, are three great advantages you get with this THOMPSON TRUFORMING application.

Write at once for complete details . . . Address Dept. 10.

The Thompson Grinder Company • Springfield, O.

COPYRIGHT 1946, THE THOMPSON GRINDER CO., INC.



We certainly don't expect you to join our growing list of customers *unless* we can give you better abrasive products for *your particular production jobs* . . . plus better service.

Our rapid growth in ten years from one of the smallest makers of abrasive products to one of the largest, didn't just happen. Company after company found we could help them get better production, lower costs . . . and give them better service. That's how we built our business.

Should you use MID-WEST abrasives? The only way we know for finding out is for you to give us a trial. It's worth it . . . if you're looking for better production, lower costs, and better service. Call us. We'll cooperate.

James Jackson
PRESIDENT

MID-WEST ABRASIVE COMPANY

OWOSSO, MICH. DETROIT ROCHESTER, PA.

GRINDING WHEELS HONING STONES COATED ABRASIVES

Continental COUNTERBORE SETS

A Size For Every Purpose

The indestructible drive and rigid, yet simple, construction of the Continental Interchangeable Counterbores assure long and dependable service. The holder and cutter are disengaged by a twist of the wrist; no tools or equipment are needed, no matter how severe the operation has been.

Continental Interchangeable Counterbores are now available in a choice of three sets, each providing a wide variety of useful, dependable tools. In complete yet compact form, you will find a selection designed to fill the needs of the large or small toolroom. Set No. 1 (illustrated), for the small shop, includes cutters up to 1 1/16" diameter, with two holders. Set No. 2, also with two holders, has cutters up to 1 1/2" diameter. Set No. 3 provides cutters up to 2" diameter and has four holders. Whichever you choose, you will be sure to get fine, precision-made cutting tools.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental

CUTTING TOOLS

- Boring Bars and Tools
- Broaches
  Broach Pullers
  Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

46—43

NORBIDE* POINTS *the way to*
Increasing Dial Indicator Gage Life 100 times

NORBIDE Tips for dial indicator gages are extremely wear-resistant, will not scratch and will not become charged with particles of metal. For NORBIDE (the trade-mark of Norton Boron Carbide) is the hardest material made by man — second only to the diamond in hardness. This explains the extraordinarily long life of NORBIDE plug, ring, snap and keyway gages and dial indicator gage points.

NORTON COMPANY - Worcester 6, Mass.

* Hardest Material Made by Man

KING offers complete range of sizes for BORING AND TURNING WORK

From 30" Single Column to 144" Double Column

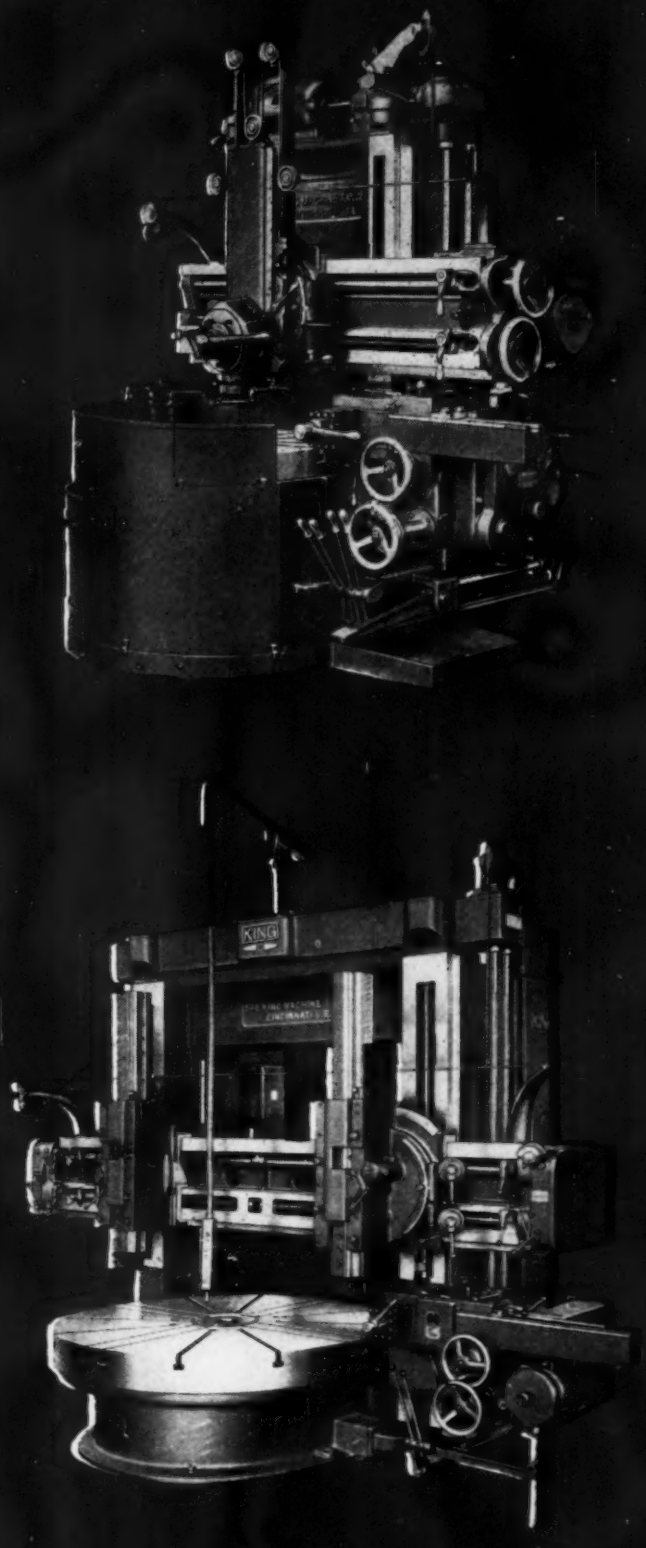
● The wide range of general purpose Vertical Boring and Turning Machines offered by KING enables you to select the size and type best fitted to your needs.

The recently announced new KING as shown in the double column illustration provides complete accessibility of all controls—a ten per cent increase in weight—new, powerful ram heads—a wide range of feeds and speeds—and many other improvements for cutting costs on your boring, turning and facing operations.

The complete line is of heavy design and rigid construction making them especially suited to the efficient and economical use of carbide tools.

King is recognized in the field as largest exclusive manufacturers of general purpose Vertical Boring and Turning Machines.

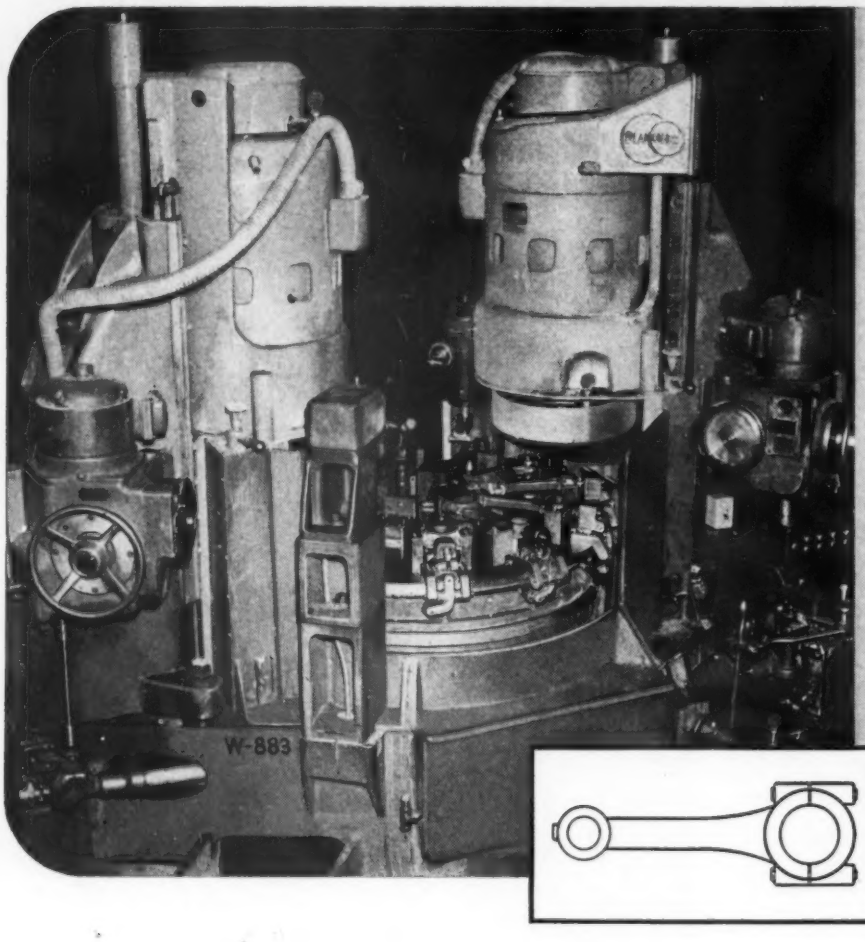
For long service and low maintenance investigate King. They're heavier—faster—have greater rigidity.



THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

"Put it on the Blanchard"



GET THESE *Advantages*

Production ✓
Adaptability ✓
Fixture Saving
Operation Saving ✓
Material Saving
Close Limits ✓
Fine Finish
Flatness ✓

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

These steel forged connecting rods are ground both sides of both ends on a No. 16-A Dual Blanchard Automatic Surface Grinder with a 43" chuck. The special 12-station fixture was designed and built by Blanchard.

From each side of both ends .012" of stock is removed to limits of ± .0005".

The production is at the rate of 400 surfaces per hour, or 100 completed pieces.

The 16-A Dual Blanchard is equipped with two grinding wheels, each with automatic size control, thus insuring the finished dimension.

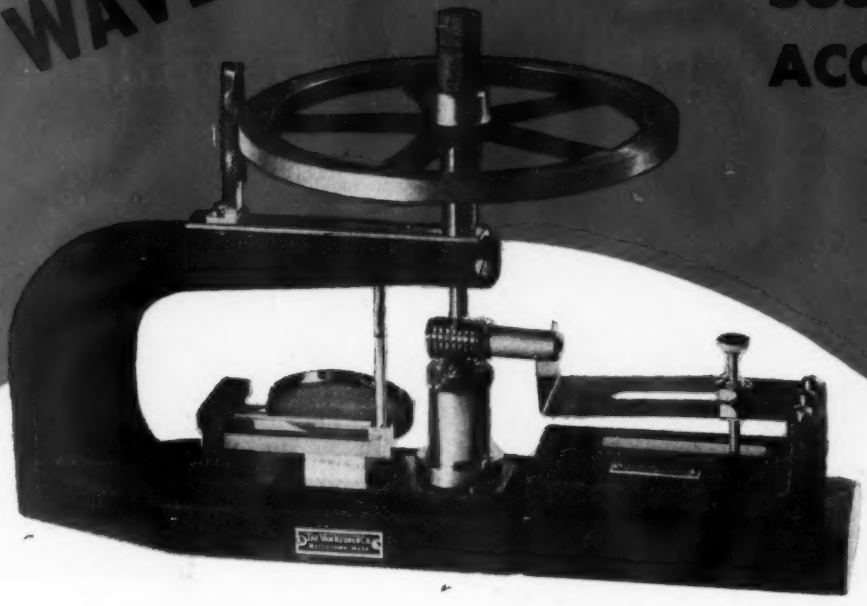
Put it on the Blanchard for more economical production.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Van Keuren LIGHT WAVE MICROMETER for SUSTAINED ACCURACY



NEW SYSTEM OF ACCURACY—The Van Keuren light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

CONTROLLED PRESSURE ASSURES UNIFORMITY—By using the sensitivity of light waves the light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

IDEAL FOR SHOP MEASUREMENTS—The light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the light wave micrometer. It is fast, accurate and profitable.

The Van Keuren light wave micrometer is described in catalog No. 33. This book also gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. *Write for your copy!*

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

27th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

How would you make these two wedge-shaped cuts?

. . . at lowest possible cost?

The PROBLEM . . .

Here's a small brass disk, on both sides of which a wedge-shaped cut must be milled. Usual practice would call for a series of indexes and passes under the cutter . . . with table advance and return for each index and pass.

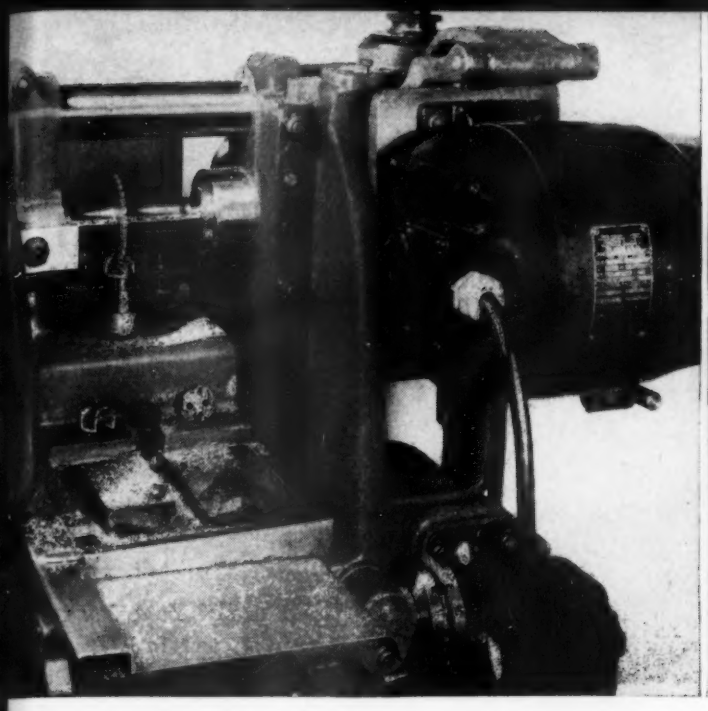
The SOLUTION . . . a No. 000 Plain Milling Machine and an oscillating attachment

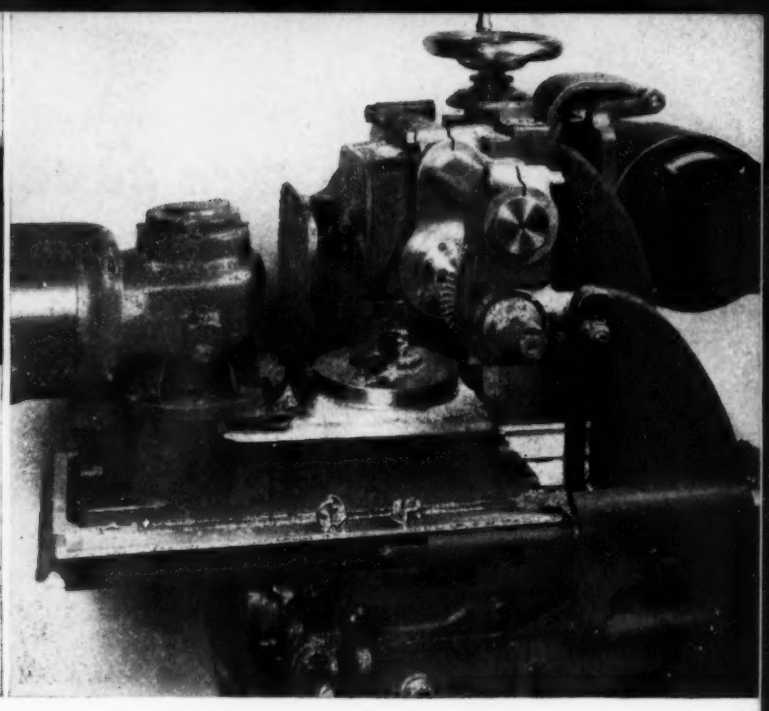
especially designed by Brown & Sharpe

B·S

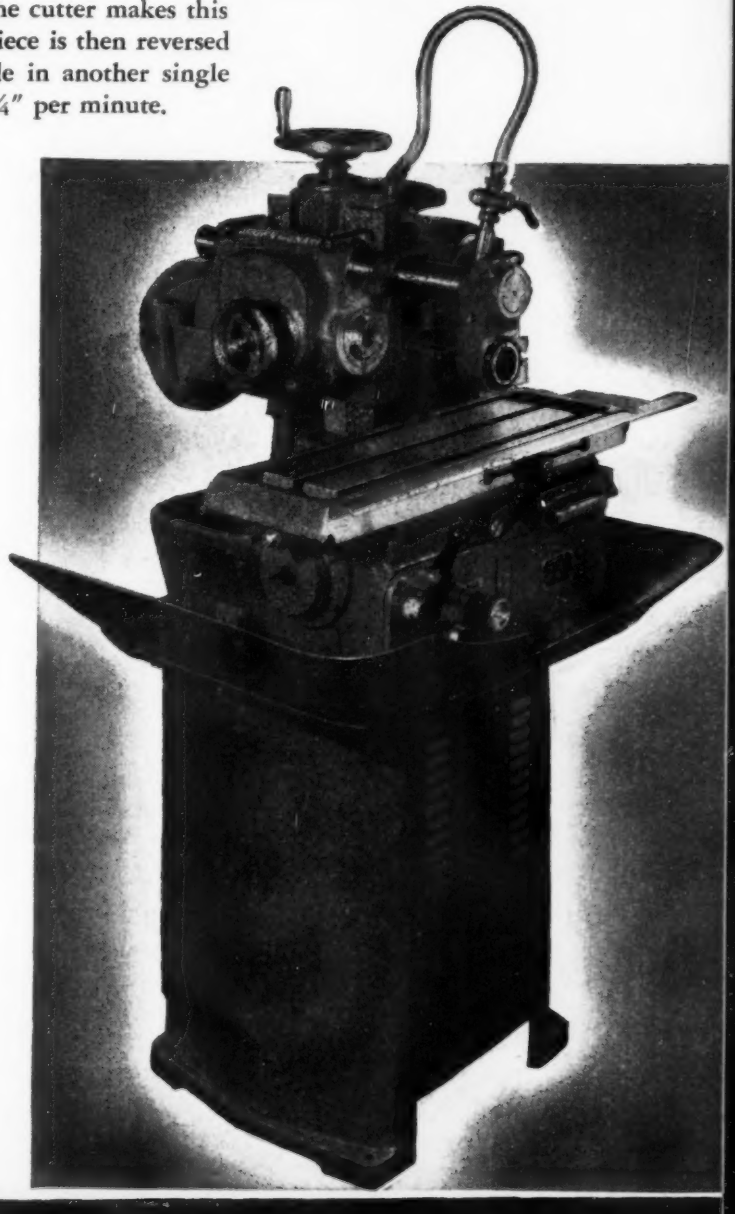
BROWN & SHARPE MFG. CO.
Providence 1, R. I., U.S.A.

BROWN &





The brass disk is oscillated as the table advances so that the cutter makes this wedge-shaped cut complete in one table movement. The piece is then reversed on the locating pins and the second, duplicating cut made in another single pass. Cutting time is 72% of operating cycle. Feed is 5¼" per minute.



That's the kind of production for which the No. 000 was designed . . . to save money on the rapid milling of small pieces. Broad, independent ranges of speed and feed enable this machine to handle a wide variety of materials efficiently . . . using cutters down to the smallest end mills. Automatic milling cycle plus the ease and speed of set-up and adjustment provide greatest possible economies of time and labor.

Brown & Sharpe Mfg. Co., Providence 1, Rhode Island, U. S. A.

SHARPE

then he said to himself:

"OK spelled backward is KO"

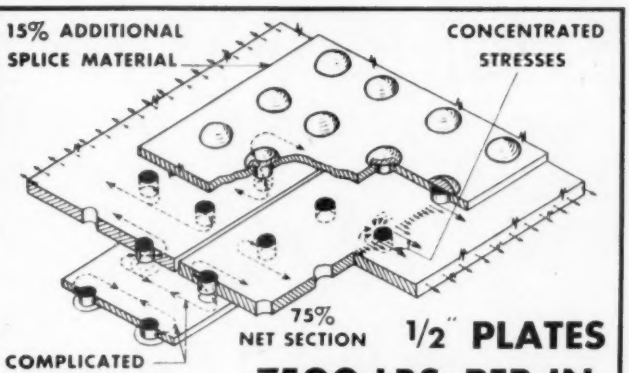
THE hero of Yugoslav resistance, the late Draja Mihailovich, at the end of a three-day questioning, finally said:

> "I wish you wouldn't torture me with rhetoric. When I am too tired, I say yes."

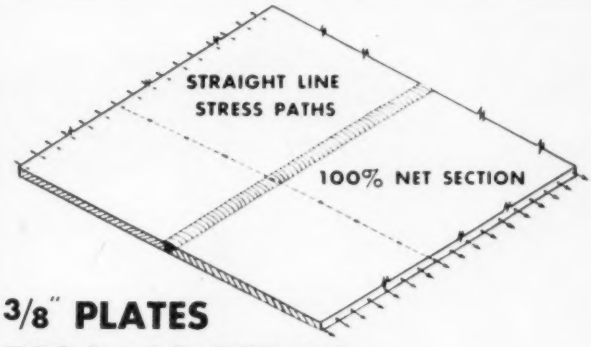
Far too many people are prone to dismiss a moot subject with a tired "Yes" . . . meaning they haven't the energy to explore for *facts* on which to base a gainful YES or NO . . . when it is so simple to do it this way . . .

Apply Draja's reasoning **to the choice between two methods of joining metal members . . . plates for example:**

Which would you *OK*?



1/2" PLATES
7500 LBS. PER IN.



3/8" PLATES
7500 LBS. PER IN.

THE RIVETED JOINT

Develops 7500 lbs./in.

Requires ½ inch plates

Requires 15% additional splice weight

Requires accurate detailing of 4 plates

Requires accurate punching of 4 plates

Requires 2 to 4 men to buck up and rivet

THE WELDED JOINT

Develops 7500 lbs./in.

Requires ⅜ inch plates

Requires no additional splice weight

Requires no detailing

Requires no plate preparation

Requires 1 man to arc weld

The Lincoln Engineer nearby will gladly help you explore further facts on the two methods as applied to your specific problems.

Machine Design Studies free to engineers and designers.

THE LINCOLN ELECTRIC COMPANY • DEPT. 294 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

NEW

A-O RUBBER FRAME GOGGLES

A-O Safety Goggles Safeguard the Eyes of Industry

Provide Maximum Protection Against Chemical and Dust Hazards . . .

The new A-O Rubber Frame Goggle has a single large acetate lens, which provides exceptional wide-angle vision. Frame is molded from non-irritating, acid-resisting synthetic rubber, which will stand up under long, hard wear. It is scientifically designed to conform to face contours, providing an acid- and dust-tight fit. Cushioned and ventilated for maximum comfort. Especially recommended for maintenance men on acid lines and storage batteries; for workers on metal plating baths, foundry shake-out, railroad car and coal handling apparatus cleaning, and in ship holds and engine cabs where dust is a dangerous factor. Send for bulletin which fully describes the various outstanding features of this new A-O development.

American Optical COMPANY *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS
BRANCHES IN PRINCIPAL INDUSTRIAL CITIES

How to get Heavy Duty High Production . . .

NEW

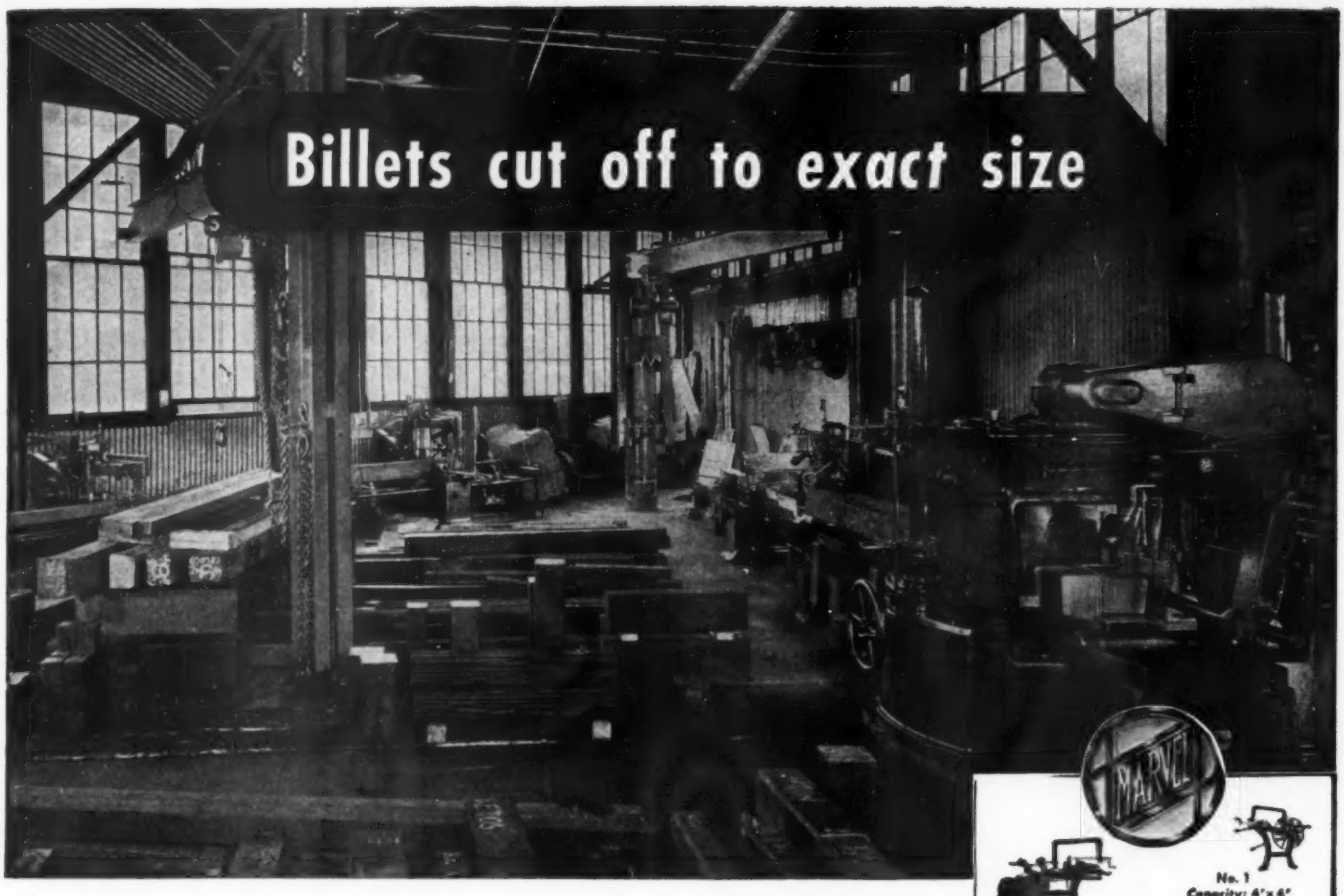
AIR-OPERATED SINGLE SPINDLE AUTOMATIC CHUCKING MACHINE

Radically different in design, it is especially suited for heavy duty high production on castings, forgings and tubing parts. You'll find complete information in our new 12-page booklet. Write us on your company letterhead for your copy of bulletin SC-46.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

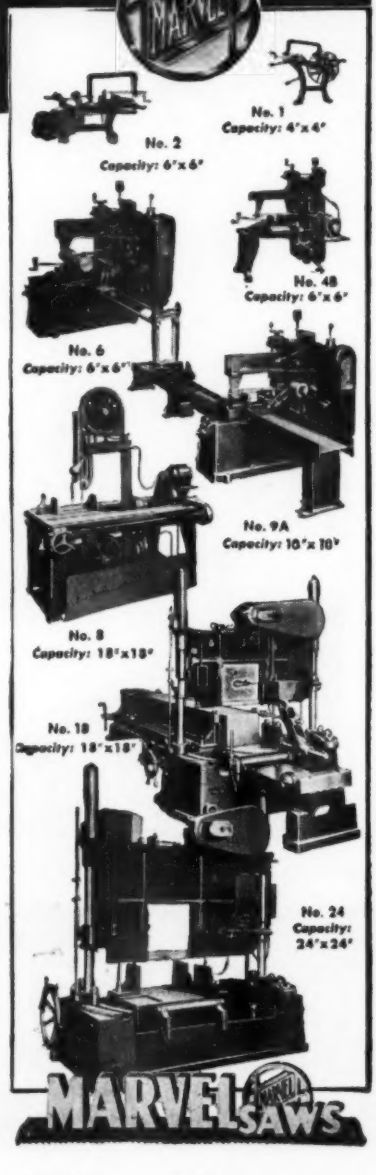
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



ANY QUANTITY CUT-OFF AUTOMATICALLY

These MARVEL Saws are money makers for this modern forge shop in many ways. (1st) they cut off billets for a small fraction of the cost of cutting-off with a hammer. (2nd) these billets are so accurate in size that they exactly fill the dies with no excess fin, not only simplifying trimming and finishing, but getting extra billets from many bars. (3rd) they keep all hammers busy on *production* work for these "world's fastest" saws can keep ahead of any schedule. (4th) they reduce cutting-off labor costs to an absolute minimum. It takes only one operator and a helper to keep all of these saws running because all but the No. 18 Giant Hydraulic Saw (at the right) are *automatic* —feed measure, and cut-off identical billets; requiring no more attention than automatic screw machines.

Your local MARVEL Sawing Engineer will gladly call and explain how you can add these five extra profits to your forge operation.



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, U.S.A.**

Eastern Sales Office: 225 LAFAYETTE ST., NEW YORK 12, N. Y.

MARVEL SAWS

COAST TO COAST—THERE'S A VARD GAGE DISTRIBUTOR NEAR YOU

You can obtain VARD high precision thread and orifice gages from reliable industrial suppliers in all sections of this country. These companies stock most of the principally used sizes in gages and can quickly secure for you gages of special size, special threads or special characteristics.

Ask your dealer for VARD gages and get the very best in inspection equipment.

•

BIRMINGHAM, ALA.
Tool Engineering Service
LOS ANGELES, CALIF.
Machinists' Tool & Supply Co.
DENVER, COLORADO
Johnson Supply Co.
BRIDGEPORT, CONN.
Ward-Nagel Tool Supply Co., Inc.
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Fulton Supply Co.
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WICHITA, KANSAS
White Star Mchy. & Supply Co.
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Murray-Baker-Frederic, Inc.
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(Bala-Cynwyd)
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MILWAUKEE, WISC.
Triplex Supply Co.

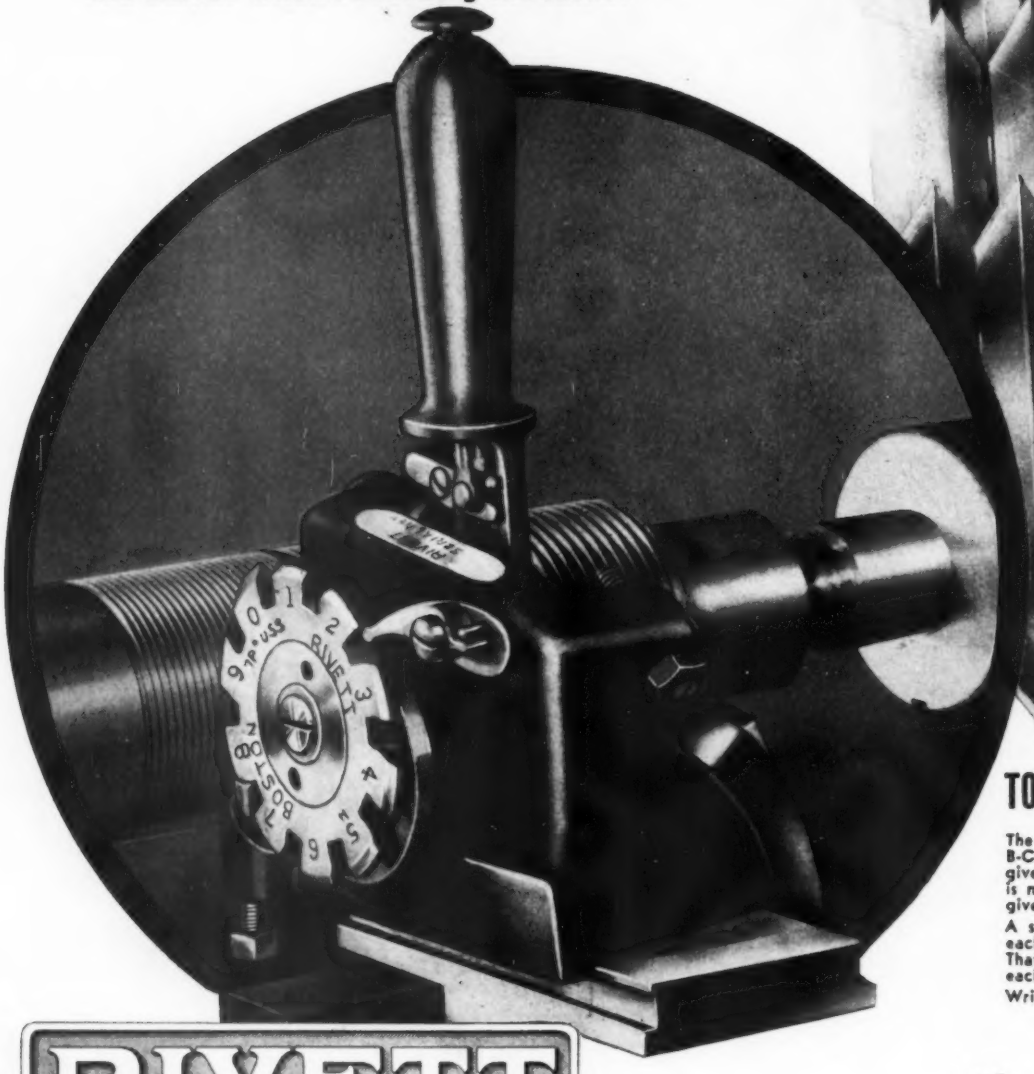
Gagemakers

VARD INC.
PASADENA 8, CALIF.

Ten Cuts to
PERFECT THREADS
on any screw-cutting lathe

Measured cuts — that allow maximum cuts without strain to metal or machine. The Rivett Thread Tool is a holder for a cutter of high speed steel that may be simply indexed by the operator.

The first nine teeth successively rough out the thread with heavy measured cuts, the tenth shaves the thread to perfect form and finish. The operator's responsibility is thus reduced from making tedious time consuming adjustments to a simple indexing of the cutter when reversing the lathe.

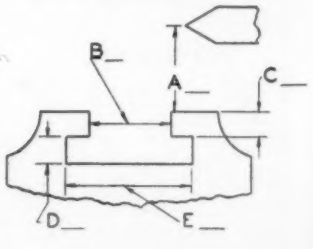


TO FILL YOUR ORDER:

The five dimensions, marked A-B-C-D-E, on the diagram must be given. Base to mount thread tool is machined to fit lathe slide and give proper height to cutter.

A separate cutter is required for each pitch and form of thread. That's why pitch and form of each cutter must be given.

Write for Bulletin No. 110.



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RIVETT LATHE & GRINDER, Inc.

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Precision-made and specially hardened, Pratt & Whitney Diamond Blue Reamers are designed to stand up during long production runs on the toughest jobs. Moreover, they can be used with excellent results on all kinds of material from aluminum and magnesium through the heat-treated alloy steels.

All P&W High Speed Steel Reamers are given the special hardening, or "Diamond Blue," treatment. The distinctive deep blue color which results is your assurance of an exceptionally hard, longer-wearing reamer.

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Faster Loading

Through Automatic Clamping on *American* Duplex Ram Surface Broaching Machine

FASTER loading means higher production—and you can get both with *American* Vertical Hydraulic Duplex Ram Broaching Machines. Uniform hydraulic clamping of parts makes loading fast and uniform, with minimum effort for the operator. Electrical controls and continuous cutting operation also contribute to maximum output at minimum unit cost. Every stroke is a cutting stroke due to alternate action of the two rams.

Engineered by *American* as the answer to many mass production problems, the Duplex Ram Broaching Machine is only one of a complete line of *American* machines and tools for metal finishing. Whatever your forming or finishing job, let *American* engineers recommend the right equipment for top efficiency. This is part of *American*'s complete broaching service—machines, tools and engineering. Ask for complete details today!

Right: Broaching joint face on differential bearing cap with standard American SBD-42-10 Vertical Hydraulic Duplex Ram Surface Broaching Machine. Left fixture is in broaching position; right fixture is in "out" position for loading. Cycle is continuous. Operator loads one side while the other is broaching. Below: the finished part, after broaching. Production may be as high as 10 seconds per finished piece.

MEMBER BROACHING TOOL INSTITUTE

American BROACH AND MACHINE CO.

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BROACHING MACHINES
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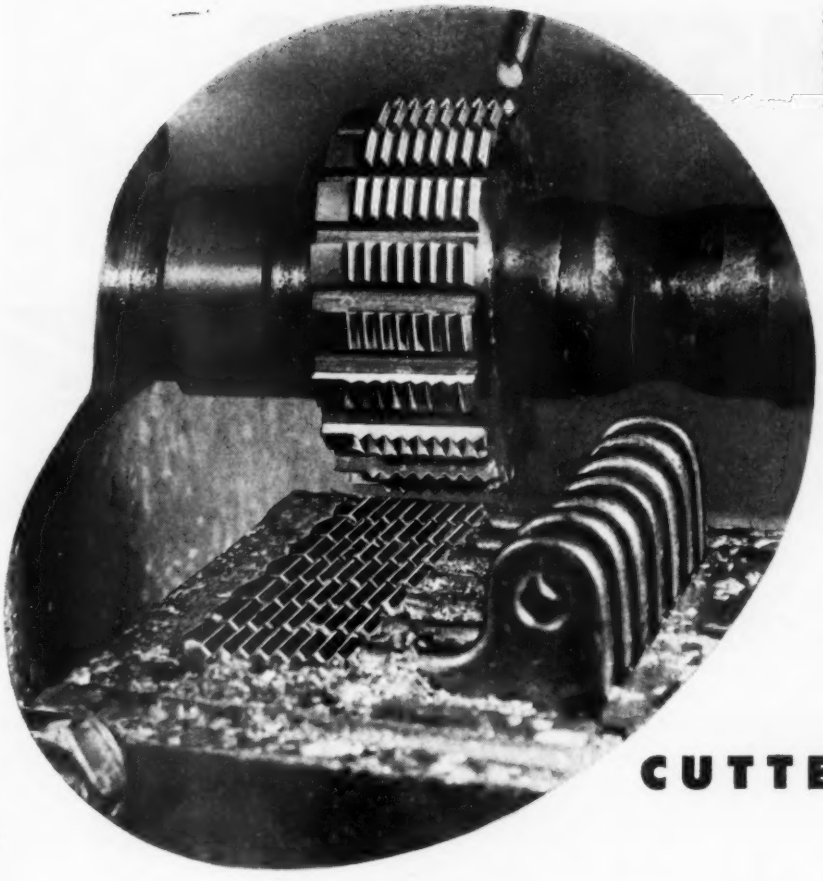
DIVISION OF SUNDSTRAND MACHINE TOOL CO.

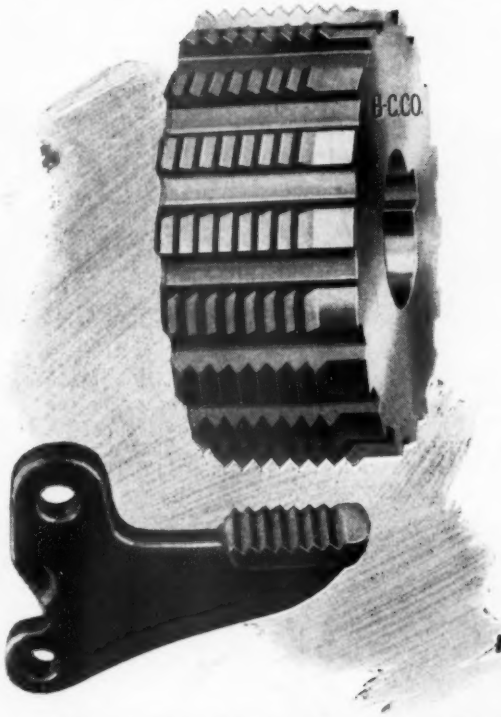


A low-cost production job on forged steel wrench jaws, using a Barber-Colman Cam-Relieved Form Cutter. The formed portion on each piece is 1-3/16" long, 9/16" wide. At 75 r.p.m., the cutter finishes 80 pieces per hour. *Tool life is exceptional — 20,000 pieces per sharpening.*

20,000

FORGED STEEL JAWS MILLED PER CUTTER SHARPENING

BARBER-COLMAN



CAM-RELIEVED FORM CUTTERS

● Such exceptional tool life as this from Barber-Colman unground Cam-Relieved Form Cutters can help you combine maximum production with minimum manufacturing costs.

Cam-Relieved Form Cutters are sharpened by grinding the tooth faces . . . not the profiles. Thus they retain their original accurate tooth shape throughout the life of the cutter. This means economical production of large quantities of duplicate shapes . . . *without deviation.*

By proper design to suit particular conditions of material and machining, these cutters are made to deliver more cuts per tool grind . . . extra long tool life . . . *low tool cost* per piece milled.

B-C Cutter Engineers are qualified by long specialized experience to advise expertly on size, type and design details of cutters to be used for a given piece of work. Avail yourself of this cost-saving service. *Place your inquiries with Barber-Colman and see what manufacturing advantages B-C Cam-Relieved Form Cutters can give you.*

For General Information on Form Cutters, See Pages 201-210 of BARBER-COLMAN Handbook "L"

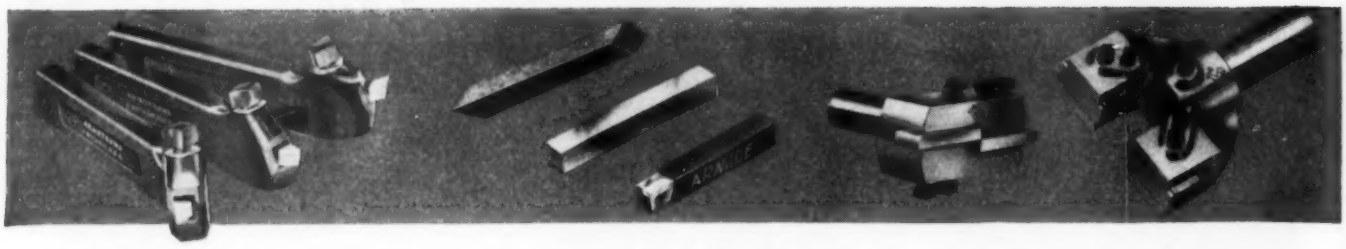
BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

ARMSTRONG

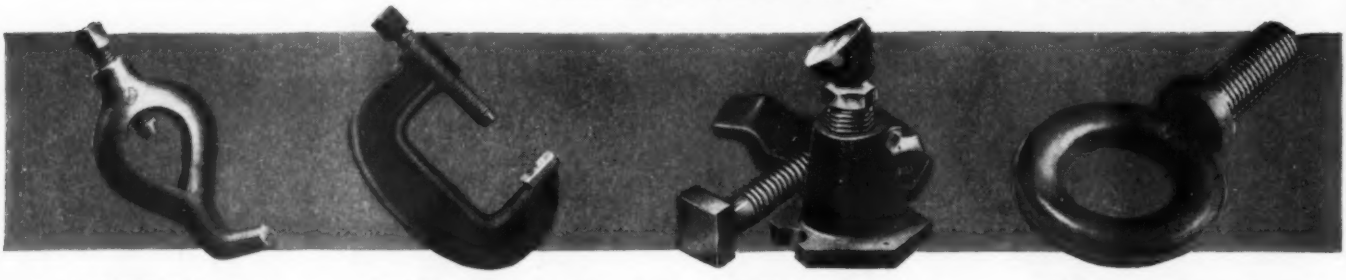
Quality TOOLS



ARMSTRONG TOOL HOLDERS
Permanent, multi-purpose tools, for every operation on Lathes, Planers, Slotters and Shapers.

ARMSTRONG HIGH SPEED
Ready-to-grind Bits...Ground Cutters.
ARMALOY Cast Alloy CUTTER-BITS
ARMIDE Carbide-Tipped CUTTERS
6 cutter shapes, 12 sizes—2 grades.

ARMSTRONG Turret Lathe and Screw Machine TOOL HOLDERS
Drill Holders, Cutter Holders, Finishing and Knurling Tools for standard operations.

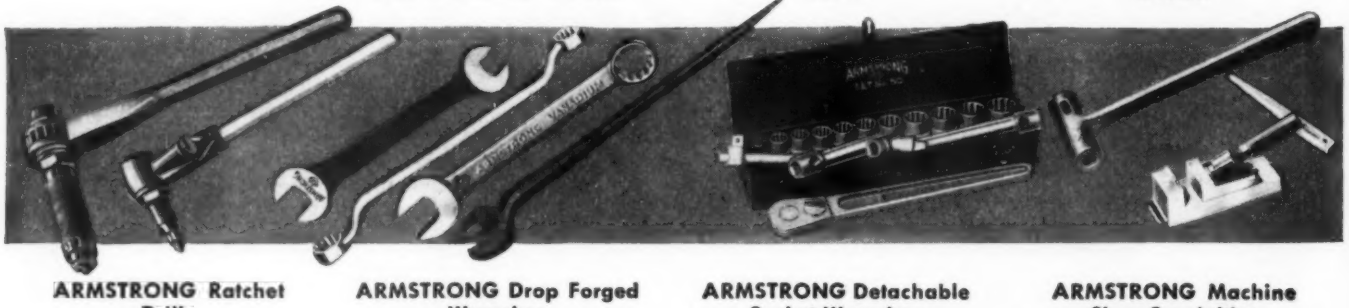


ARMSTRONG Drop Forged DOGS
Lathe Dogs, Milling Machine Dogs, and Clamp Dogs. 12 types, all sizes.

ARMSTRONG Drop Forged "C" CLAMPS
Heavy Duty, Medium Service, Deep Throat, and Tool Makers' types in all sizes. Also Machinists' Clamps.

ARMSTRONG Setting Up Tools
A complete line of Drop Forged Strap Clamps, Planer and Bracing Jacks and T-slot Bolts.

ARMSTRONG Drop Forged Eye Bolts
Plain or shoulder pattern. Blank or Threaded. 14 sizes, Drop Forged and heat treated.

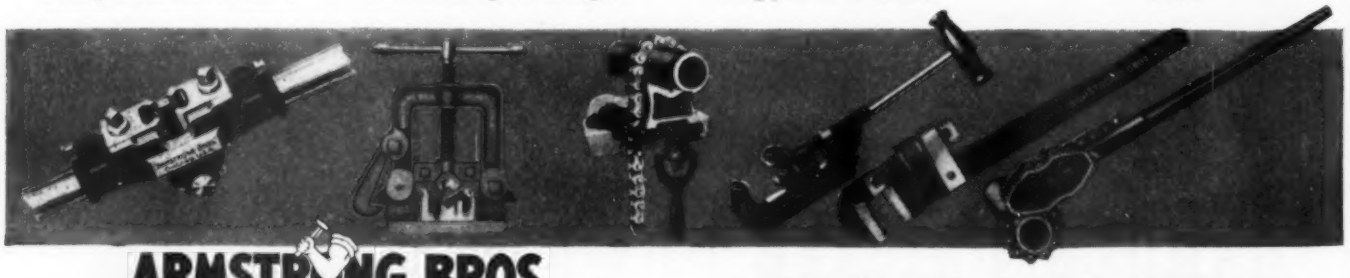


ARMSTRONG Ratchet Drills
All steel wearing parts hardened. Packer, Railroad, Standard, and Short types, both plain and reversible.

ARMSTRONG Drop Forged Wrenches
Both Carbon and Alloy Steel. Over 100 types in all sizes. Improved designs, steels, and heat treating ... stronger.

ARMSTRONG Detachable Socket Wrenches
All sizes and types with driving handles, extensions, and drop forged ratchets. Sold singly or in cased sets.

ARMSTRONG Machine Shop Specialties
Drill Drifts, Tool Posts, Drill Holders, Cutter Grinding Holders, and Tool Makers' Vices.



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Better Pipe Tools. A complete line, each a better tool with hardened, alloy or drop forged parts wherever they will add to strength or tool life.

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"The Tool Holder People"
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You can

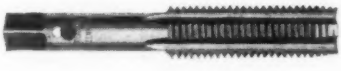
TAPS *That Thread Well*

by the THREADWELL DOT

Threadwell "i-dot-ification"—red dot for cut thread, *white* for commercial ground, *blue* for precision ground—is more than a quick, convenient means of identification for use and a positive assurance you get the tap you pay for. It identifies the tap as a product of *Threadwell* precision craftsmanship; a tap that has met the most exacting standards of testing and inspection; a tap that will give you better threads and more threaded holes whether you're tapping steels, cast iron, alloys or plastics.

Threadwell is a good name to remember. Look for the name and the color dot on every high speed tap. *Threadwell* Taps are available through a leading Mill Supply Distributor in your locality. Let us put him in touch with you.

DOT'S NOT ALL!



Threadwell Taps have

COLD-TEMPER—treated at 120° below zero for extra toughness without brittleness.

TAP-CAPSULE—in individual transparent plastic tubes that protect ground-threads and permit quick selection of type and size before unwrapping.

GREASELESS RUST-PROOFING—by an exclusive *Threadwell* process that keeps the tap clean and dry, ready for instant use.

Remember. Threadwell COLD-TEMPER I-DOT-IFIED, TAP-CAPSULED, RUSTLESS Taps *cost no more* than any other high speed taps.

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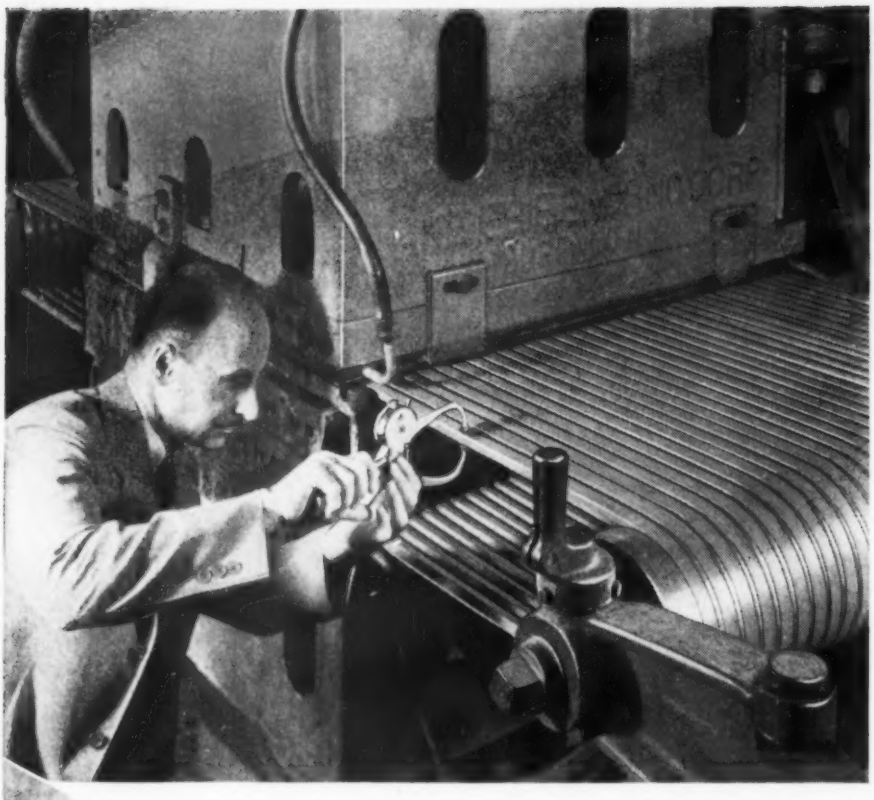
PUTTING ON THE Pressure

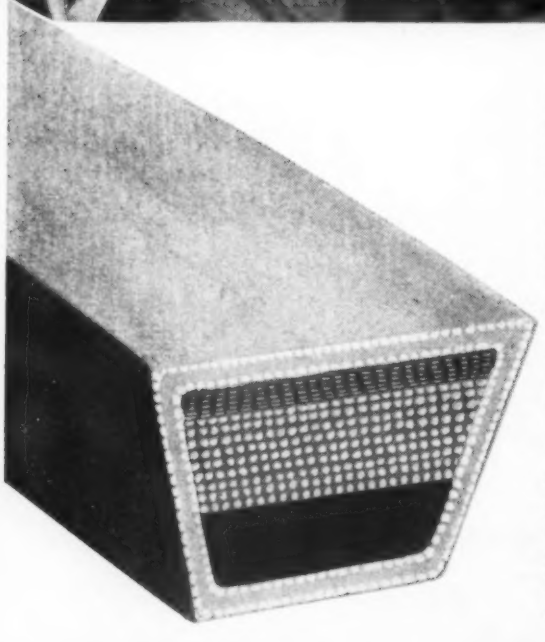


to give you tougher, truer-running TEXROPE V-BELTS

PRECISION curing in these powerful pressure molds gives TEXROPE Super-7 V-Belts their toughness and accuracy of section.

The molds themselves are machined to precision tolerances. Heat, pressure and curing time are accurately controlled. Skilled operators check every step of the process.

This careful curing combines strong, hard-twisted cords, rugged two-ply cover stock and shock-absorbing rubber into BETTER V-BELTS to drive your machines —uniform, long-lasting, smooth-running.



Heat-Resisting Super-7
Stands temperatures up to 180°. The TEXROPE V-Belt for most drives.

Oil-Resisting Super-7
Neoprene cover protects core against moderately oily or greasy conditions.

Oil-Proof Super-7
Made of Neoprene throughout. Use it when the belt must swim in oil.

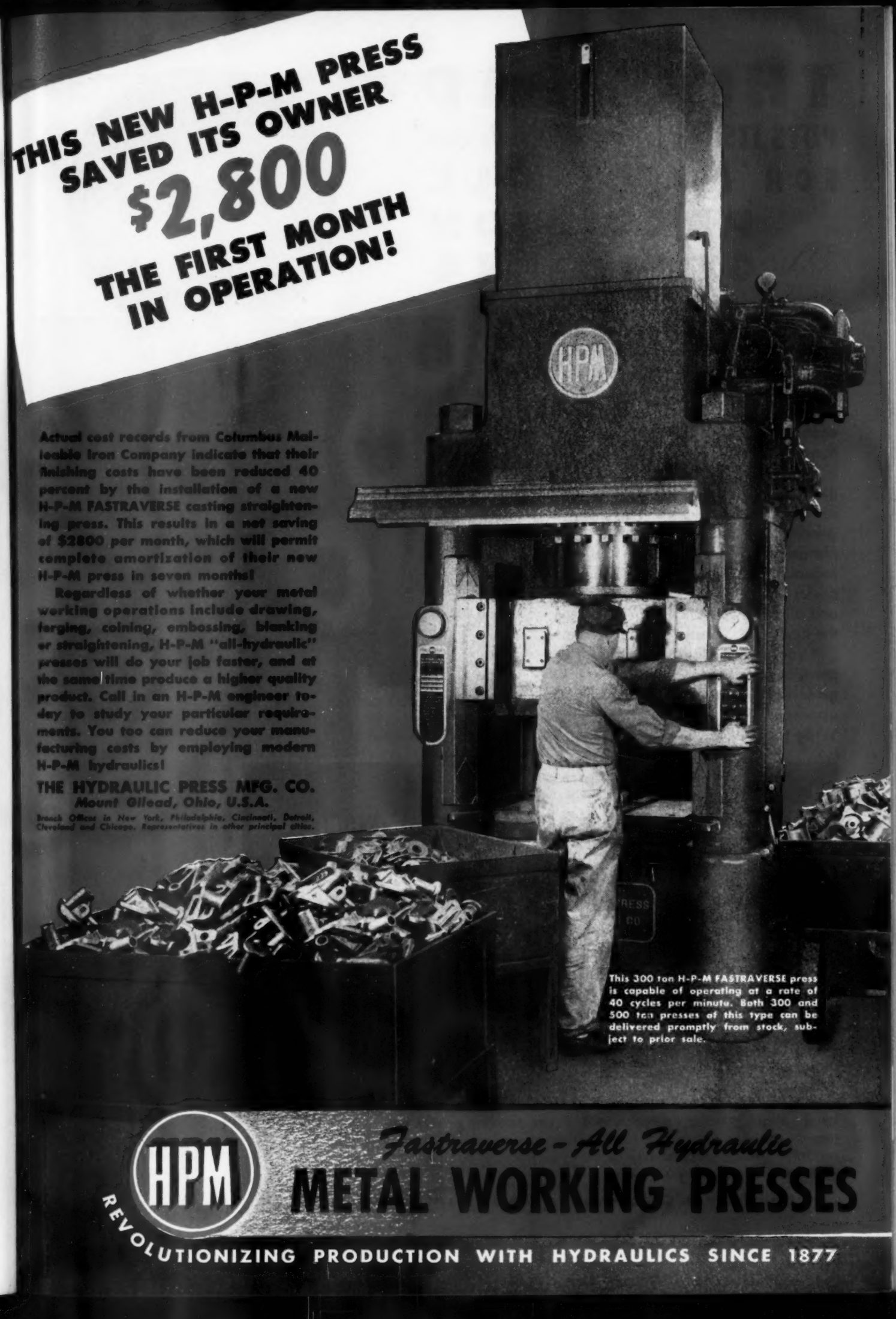
Static-Resisting Super-7
Recommended where explosion hazard exists. Static-conducting element throughout cover won't wear off.

ONE CALL — FOR ALL V-BELT DRIVE NEEDS

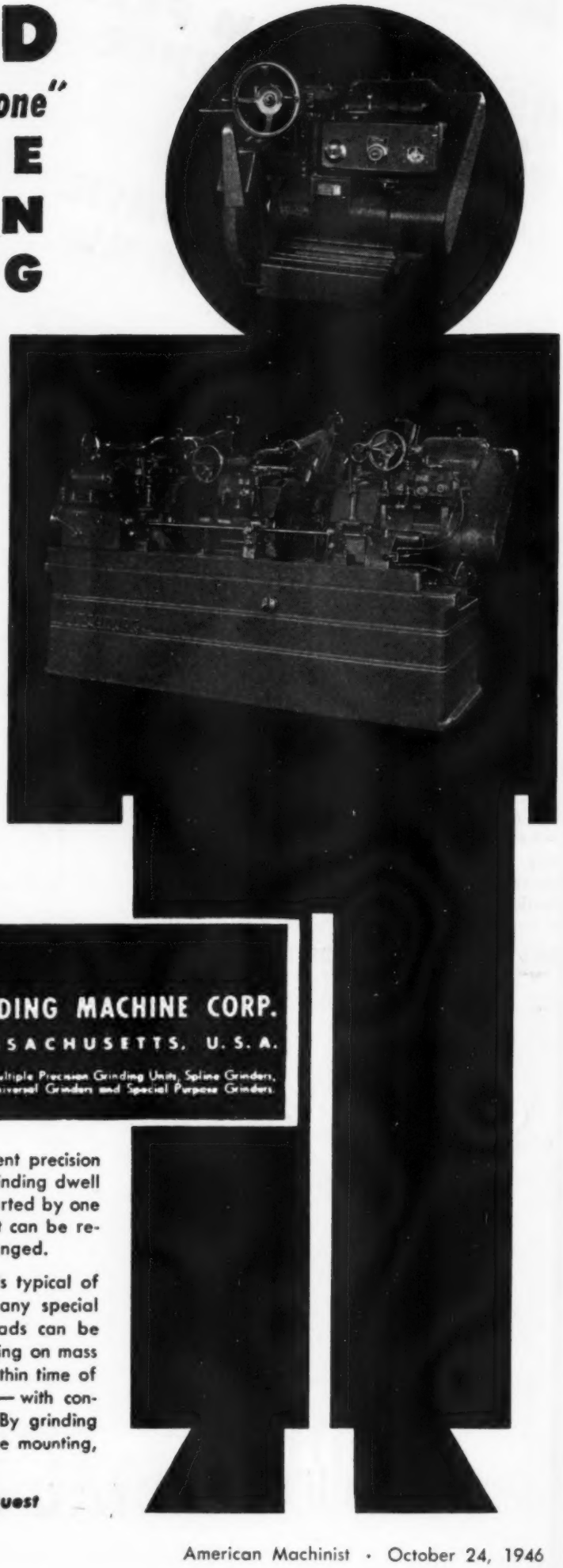
Your nearest Allis-Chalmers office or dealer offers COMPLETE V-Belt Drive service: Super-7 V-Belts in all types and sizes — full range of standard, "Magic-Grip" and Vari-Pitch sheaves — Speed changers — experienced engineering aid by the originators of industry's Multiple V-Belt Drive. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2101

ALLIS AC CHALMERS
One of the Big 3 in Electric Power Equipment —
Biggest of All in Range of Industrial Products

TEXROPE V-BELT DRIVES


THIS NEW H-P-M PRESS SAVED ITS OWNER
$2,800
THE FIRST MONTH IN OPERATION!
Actual cost records from Columbus Malleable Iron Company indicate that their finishing costs have been reduced 40 percent by the installation of a new H-P-M FASTRAVERSE casting straightening press. This results in a net saving of $2800 per month, which will permit complete amortization of their new H-P-M press in seven months!
Regardless of whether your metal working operations include drawing, forging, coining, embossing, blanking or straightening, H-P-M "all-hydraulic" presses will do your job faster, and at the same time produce a higher quality product. Call in an H-P-M engineer today to study your particular requirements. You too can reduce your manufacturing costs by employing modern H-P-M hydraulics!
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.
Branch Offices in New York, Philadelphia, Cincinnati, Detroit, Cleveland and Chicago. Representatives in other principal cities.
HPM
This 300 ton H-P-M FASTRAVERSE press is capable of operating at a rate of 40 cycles per minute. Both 300 and 500 ton presses of this type can be delivered promptly from stock, subject to prior sale.
HPM
Fastraverse - All Hydraulic
METAL WORKING PRESSES
REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

THIS HEAD
PUTS ITS *"Nose to the Grindstone"* FOR MULTIPLE PRECISION GRINDING



To bring precision grinding the advantages which multiple tooling and combined cuts have given machined work in mass production, Fitchburg engineers put their heads together.

The result, the Fitchburg independent standard Bowgage Head, completely self-contained, and enabling one machine to perform as many operations as it has heads with which to grind.

For instance, a machine can be arranged for plunge-cut grinding one end and the second head set up for hydraulic traversing for longitudinal grinding, while the number three head is also plunge-cut grinding the other end. This is advantageous on gun barrels or long spindle type pieces where three operations are necessary — and all three operations will be performed within the time of the longest single operation!

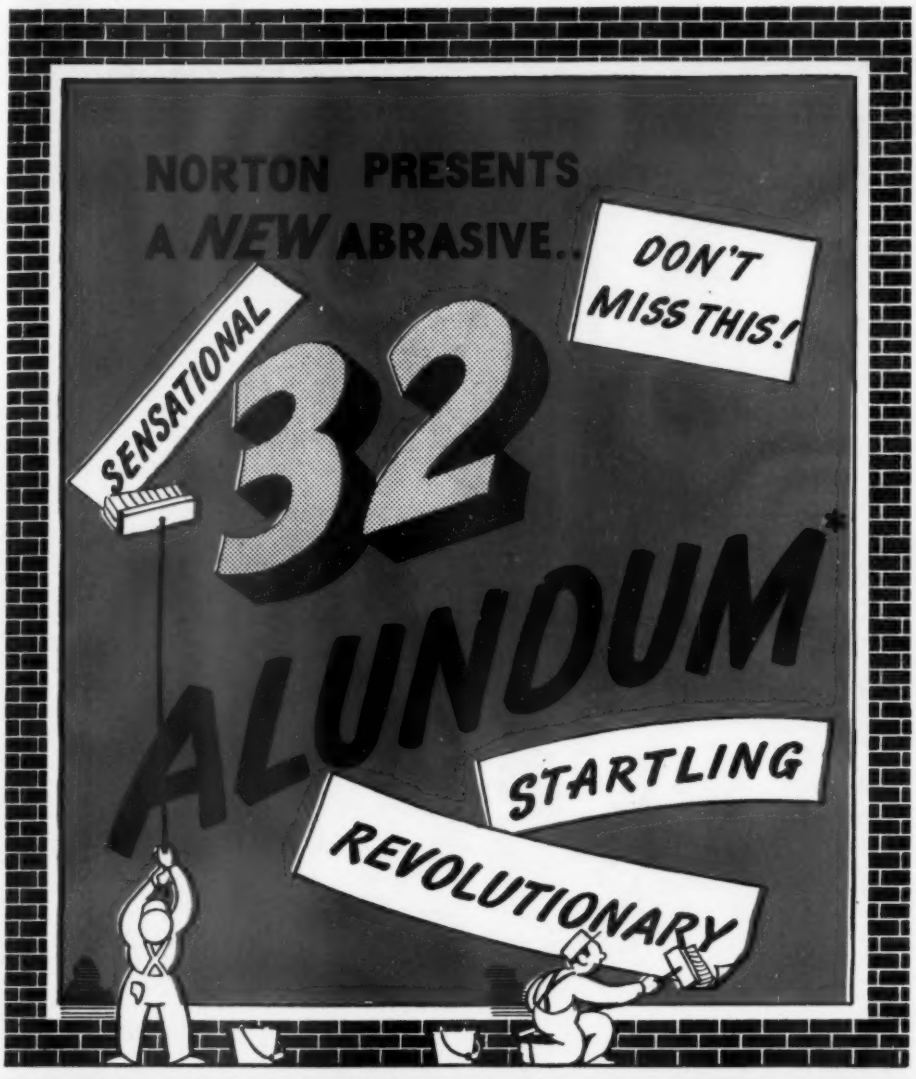
If you have an "axe to grind" with your current production speeds and costs, let Fitchburg engineers show you how the Fitchburg method can be applied to your special problem. No obligation. Write today !

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *The Fitchburg Triple-Head Machine* illustrated is typical of the functional engineering and rugged construction of many special machines into which independent Fitchburg Bowgage Heads can be built to cut costs through multiple automatic precision grinding on mass production. It grinds three dimensions at the same time, within time of longest single grinding operation, and in one handling — with consequent saving in time and reduced danger of spoilage. By grinding several dimensions automatically on the same piece, at one mounting, it releases operator for other work.

Write Today for Catalog—Sent Free Upon Request



FEATURES OF 32 ALUNDUM*

It is an entirely new type of aluminum oxide abrasive — made differently by a Norton-invented and patented process. Each super-cutting grain is a single crystal — individually produced in the electric furnace — not crushed to size. Each crystal combines a sharp, nubbly surface for fast cutting with a strong grain structure for long life.

BEING New Englanders we're usually pretty conservative in our advertising messages. But here's a new abrasive so radically different, so outstanding in performance, that it really needs Hollywood adjectives to do it justice.

In test after test in the field 32 ALUNDUM* grinding wheels have been truly sensational. They cut faster, cut cooler, last longer and require fewer dressings.

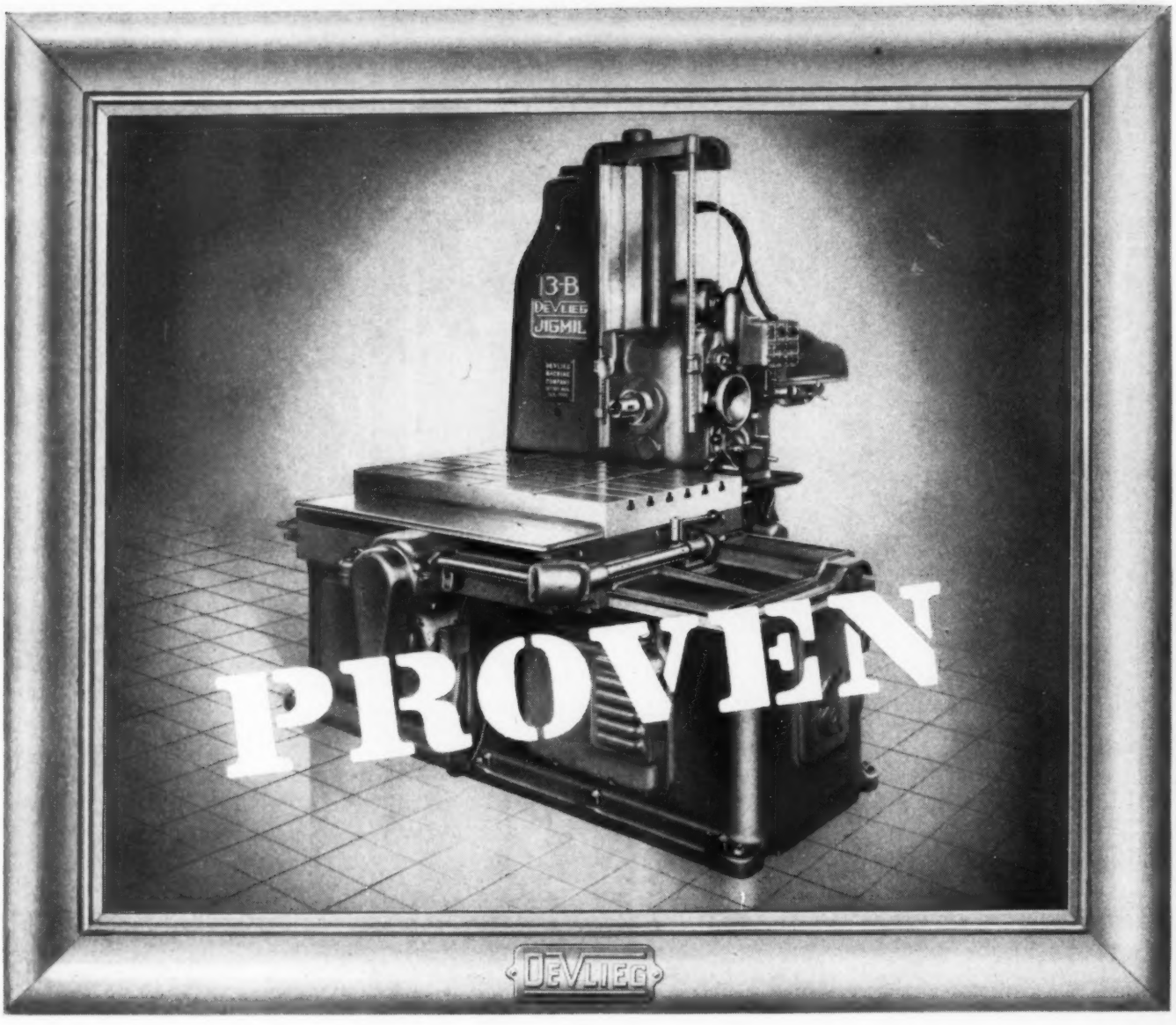
Your production man will want to take advantage of 32 ALUNDUM*.

NORTON COMPANY, WORCESTER 6, MASS.
(The Behr-Manning Division is at Troy, N. Y.)

NORTON ABRASIVES

* T.M. REG. U.S. PAT. OFF.

Ask your Norton abrasive engineer for a Vectograph demonstration of 32 ALUNDUM abrasive and write for a copy of GRITS and GRINDS, Vol. 37, No. 9.



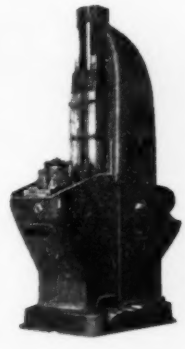
The World's Finest Boring and Milling Machine

THIS new model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten thousandths part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL Idea is a totally new approach to the problems of precision boring at a new low cost.

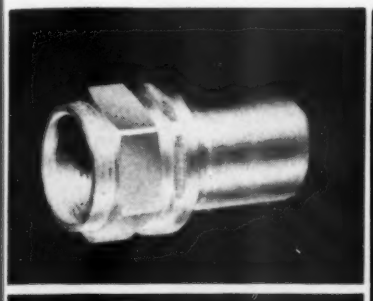
DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

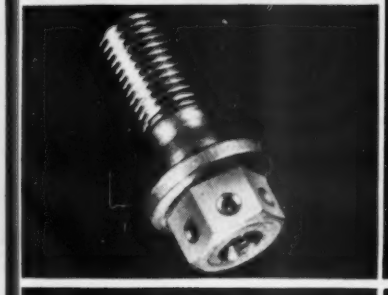
Surface Broaching
WITH INDEXING FIXTURES

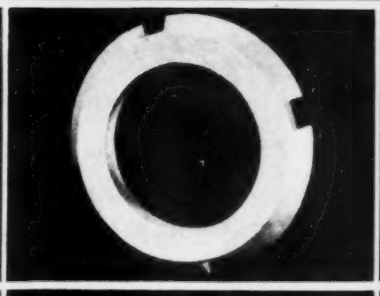
MANY parts having a multiple of duplicate machined surfaces may be surface broached to increase production thru the use of especially designed indexing fixtures. Parts need to be loaded but once. In many cases indexing is performed during one stroke of the machine. In other cases the indexing is performed at the end of each stroke and the cycle is automatic until the required number of strokes have been completed. If you have parts similar to these illustrated we will be glad to work with you on the possibility of increasing production, improving finish, or decreasing tool maintenance cost thru the use of Footburt Surface Broaching machines.

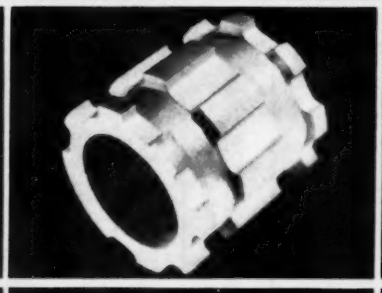


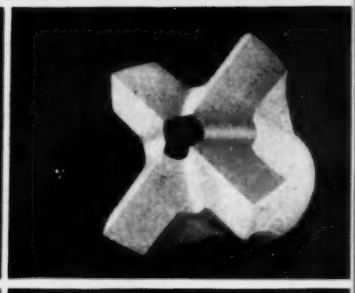
THE FOOTE-BURT COMPANY
CLEVELAND 8, OHIO
Detroit Office: General Motors Building

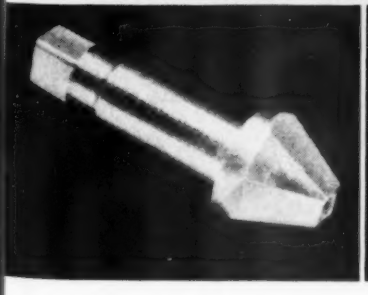


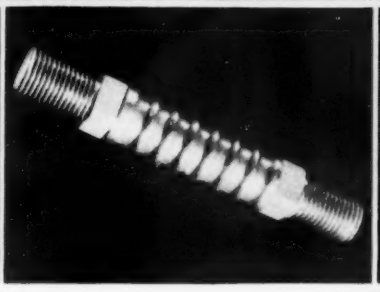


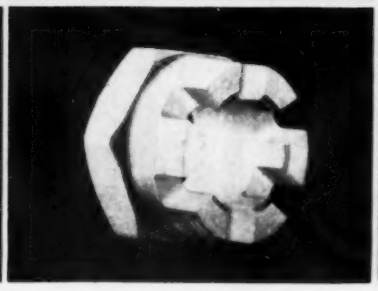


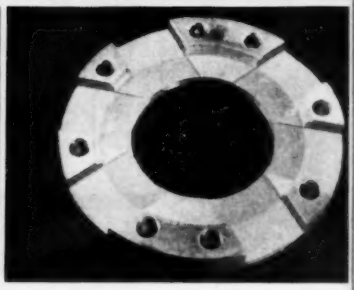






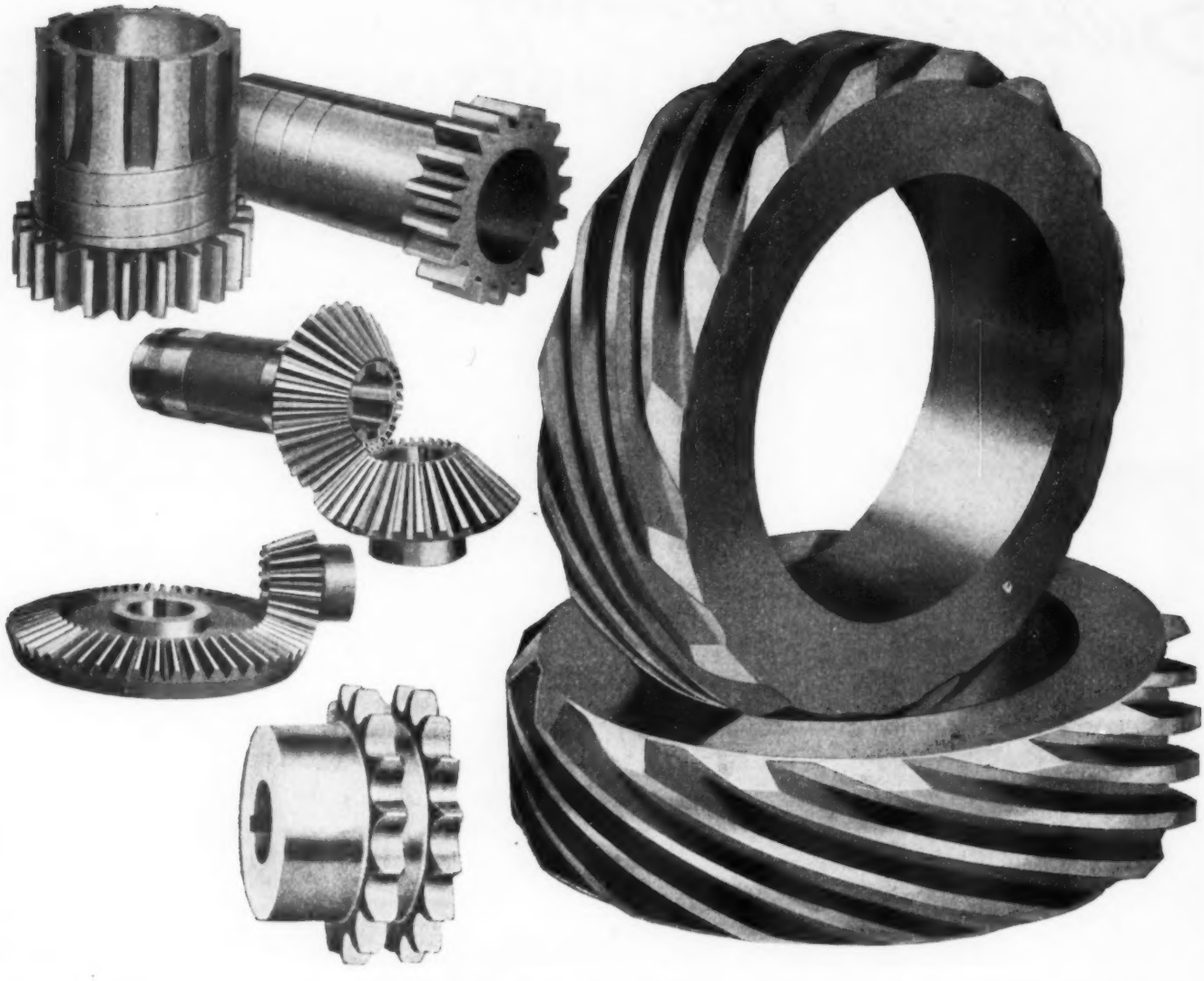






Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*



GEARS

We are specialists in the production of GEARS for individual needs. You are assured of uniformity and accuracy regardless of the quantities or the gear types you need. We meet your specifications in full.

Get the benefit of our long experience for your next gear needs. Our engineering service is available for consultation.

The ADAMS COMPANY
DUBUQUE, IOWA
ESTABLISHED 1883

THEY CUT THE TIME *in half!*

- ***Equal Efficiency of Every Unit Makes the Balanced Machine.***

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We quote the Package Machinery Company of Springfield, Massachusetts—and again, "The job is very intricate: 32 holes accurately laid out are drilled and reamed, two at a time; depth, 6 inches. Tapping to 1¼ inches is done singly."

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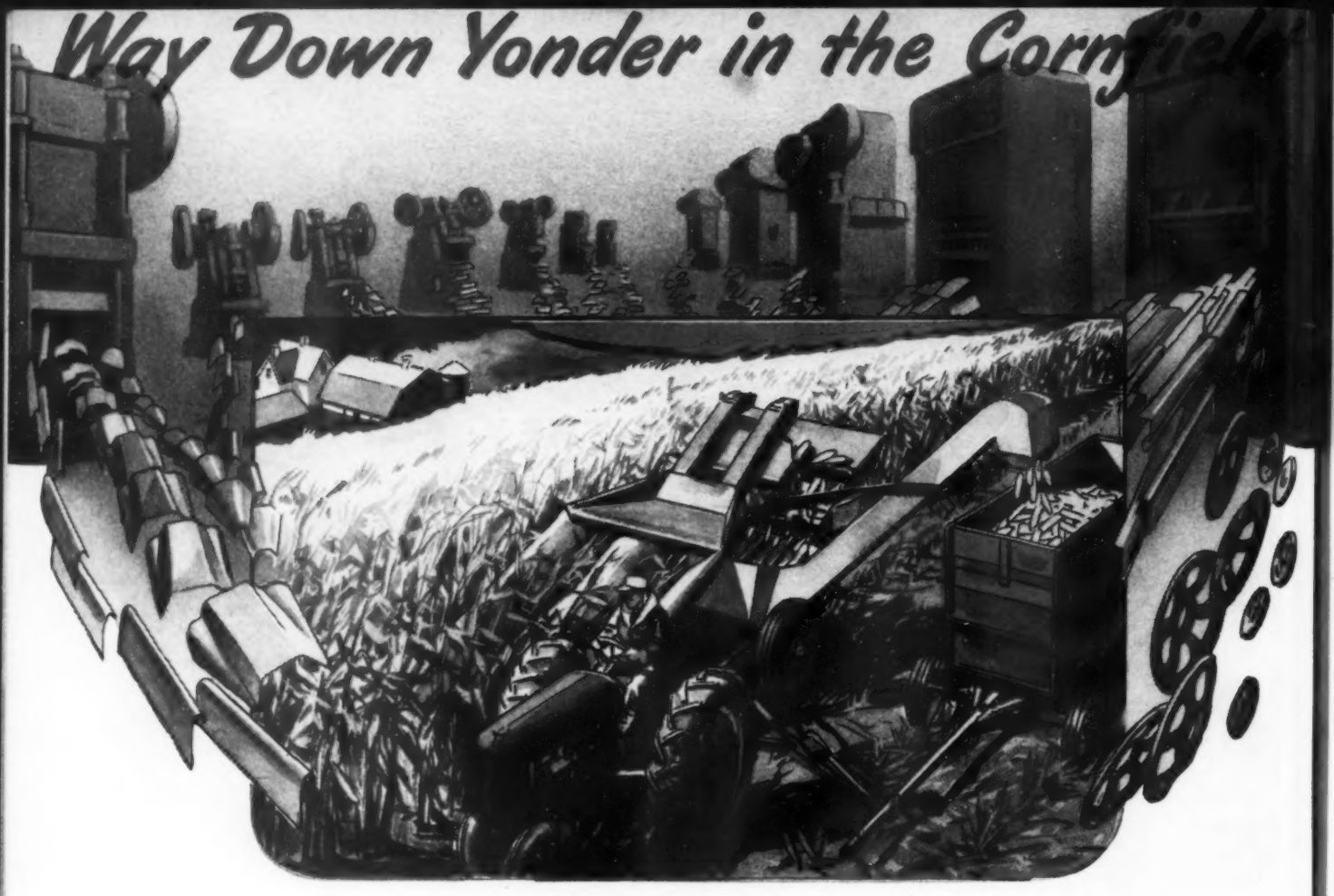

Press Production is Doing Its Part

The bronzed farm hand with the hefty forearms is no longer the champion corn husker of the state of "Ioway." The mechanical Corn Picker has taken top honors in that field. Modern machinery, replacing manpower in America's grain belt, accounts for a great part of the harvest.

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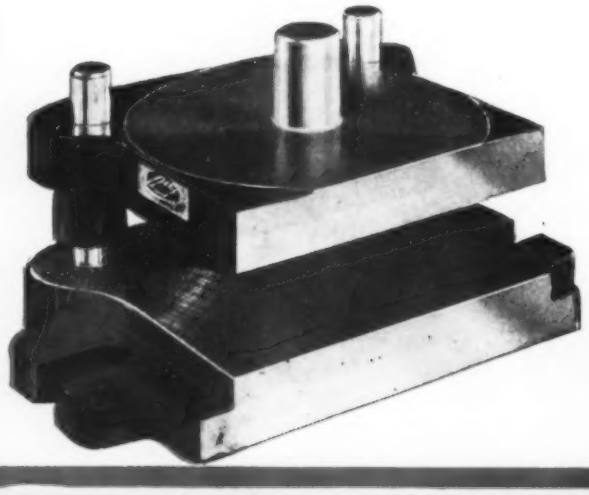

DIE MAKERS' SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication

American Machinist's Spot NEWS OF METALWORKING

Deliveries of 50-75 weeks are being quoted on integral horsepower motors. Current production of 1,800,000 fractional horsepower motors a month is not enough. Magnet wire for motor stators being turned out at a rate of 30,000,000 lb. per month, or twice the April output.

Chevrolet has started buying machine tools and other equipment for 1948 models to be introduced in the fall of '47. Other companies are expected to follow suit. Radical changes will be made in '48 cars, the first major innovations for most companies since prewar days.

First postwar British Industries Fair will be held in London and Birmingham next May 5-16. Birmingham section will cater to engineering and hardware, the London section to lighter industries. Birmingham Chamber of Commerce will be responsible for the Birmingham section.

Some standard machine tools now are being offered for 4-6 weeks' deliveries. Machines requiring some special attachments are quoted for 3-4 months' shipment, in certain cases.

Eight shipyards in addition to 14 previously assigned are now available for shipbreaking (breaking ships for scrap). Drastically reduced rental rates apply for such purposes. Navy and the Maritime Commission have withheld some ships, but sales for scrap are far in excess of yard capacities.

Ford factory at Sydney, Australia, recently completed first 1946 deluxe V-8 Ford, 80% of Australian manufacture and 20% of Canadian. Price is $2,060 plus 12½% sales tax. When local parts people can supply enough components, plant will build over 40 cars a day.

Each industry taken over by British government as result of nationalization will continue to pay into Treasury as much as it formerly did. Calculation will include individual as well as corporation income taxes. Government has no desire to make a profit, but intends to prevent any loss of revenue and perhaps provide a small surplus.

Two machine tool plants at Hiroshima, four miles from center of atomic bomb explosion, were damaged only superficially, reports A. B. Einig, Cleveland machine tool man. Plan is to take away 90% of Japanese capacity for making precision bearings. Main shop of Korean railroad on Japanese Sea compares favorably with best U. S. railroad shops. Equipment consists of Japanese copies of American machines, including Bullards.

Big presses, 200 in. between uprights, are being built to stamp out steel tops for '48 cars. These presses will pay for themselves in 3-4 months, according to buyers' calculations.

Two corncerns in Bombay, India, plan to make autos. Motor House, Ltd., has concluded an agreement with Kaiser-Frazer Corp. to make autos under license.

Demands of molded and laminated plastic makers are three times the capacity of the plastic materials manufacturers to supply the raw materials. Next year at least $125,000,000 will be spent to increase plant equipment in the plastics industry. By end of this year 3400 injection molding machines will be in use in this country.

Output of galvanized sheets and of nails for fourth quarter has been sewed up by priorities. Washington officials may pay a premium of $20 a ton on nails to get increased production.

Increase life of tools

ONE of the most important advantages of *Texaco Cutting and Soluble Oils* is their widely proved ability to increase tool life. Results like the following are reported by users —

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ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

How to Get More Castings

An old-time manufacturing man said recently that he never expected to live to see a shortage of pig iron.

But the shortage is with us, bringing the grave threat that many metalworking plants must close for lack of castings.

The excuse for this shortage is small and close to being non-existent. It stems partly from the effects of strikes, to be sure. More than that, however, it comes from the inability or outright refusal of OPA to view matters realistically and sensibly by removing controls on steel and pig iron.

Anyone familiar with metalworking should know that as long as the present ceiling holds on steel scrap, pig iron will be used as a substitute. That in itself makes for an artificial situation and actually aggravates an already bad condition.

When demand for pig iron soared, higher prices under normal circumstances would bring about increased output, thus easing the tightness. But OPA stepped in and, as one observer has said, "set up a queer combination of price ceilings and subsidies which are as unrealistic as they are harmful."

These controls have worked badly. They have not made a tight market any easier. Yet there is no sign of their being abandoned.

A strange psychology pervades Washington. When laws, rules and regulations fail to produce the expected result, the answer appears to be to revise, strengthen and amplify them. More controls rather than less are applied.

No one seems to think that it might be a good idea to try the simple expedient merely of freeing a product from price fetters and then seeing what happens.

We have in mind the interim period last summer when OPA was temporarily suspended. Suddenly and miraculously meat appeared for sale in plentiful quantities at somewhat higher prices than previous ceilings allowed, but far below black market levels. As time went on, those prices gradually came down.

Then ceilings were slapped on again, and the flow of meat dwindled to a trickle and now almost has disappeared. We wager that now the ceiling is taken off, meat will come into the markets surprisingly fast.

The same principle holds with pig iron. Why not take off the ceilings and see what happens? If things should get out of hand, ceilings can always be clamped on again.

We will give odds, however, that it would not be necessary to put them back on and that we would have more pig iron quickly.

Let's try it!

Burnham Finney

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Here one Cincinnati Press Brake producing steel cabinets has replaced a battery of machines—changed repeated floor-to-floor handling to one simple hand-to-hand transfer. The work is merely passed from man to man along one machine to complete the series of operations.

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Write for Catalog B-2

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SHAPERS · SHEARS · BRAKES

Thin-Stock Dies for Secondary Operations

BY WALLACE C. MILLS, ROCKFORD, ILL.

Success in beading and curling shells under 0.020-in. thickness depends on application of basic design principles for thin metal

BASIC PRINCIPLES for forming thin sheet metal under 0.020 in. are applicable not only to the design of first-operation dies but also to the design of tools for secondary operations such as curling, beading and threading. These secondary operations are performed on the outside surfaces of thin metal shells after they have been blanked and drawn to cup shape.

Different cases require different tool construction. The design of a curling tool, for example, depends on whether the curl is outward or inward and on the thickness of metal and other conditions. Because of the many factors affecting the design, standard tool drawings and drawings illustrating metal-forming principles and showing tool elements for each case aid designers in planning the necessary tooling. Details that improve operation have been included in the drawings shown here in an effort to simplify further the design for secondary operations.

Curling principles are illustrated in Figs. 1 and 2 for curling on the periphery and interior flanges of shells. Their embodiment in tools is shown in Fig. 3 to 6. Beading, sizing, reducing, nib forming and threading tools are shown in Fig. 7 to 11.

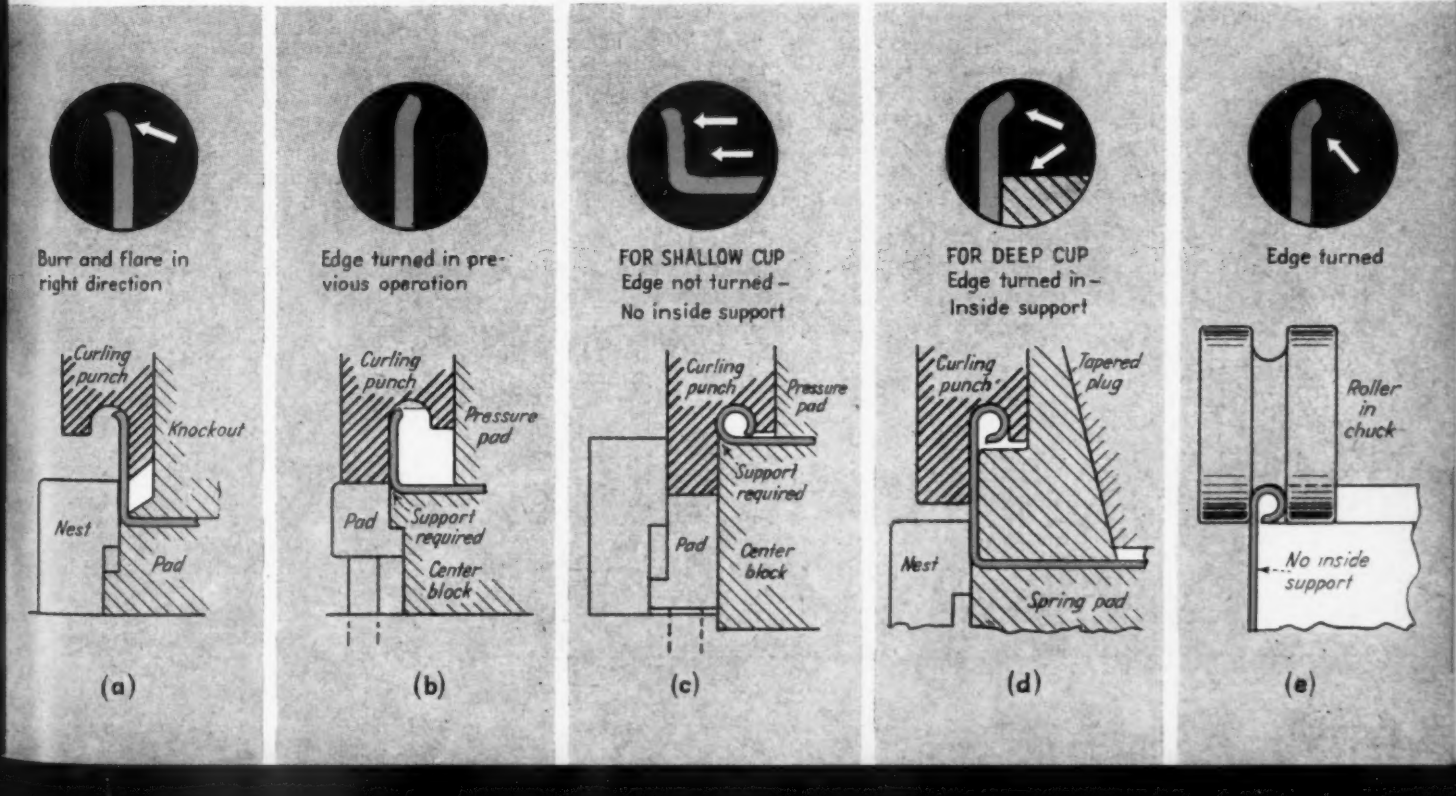
Burr and Flare Affect Curling

Fig. 1 (a) shows the principle of outward curling on the edge of a shell. Outward curling is by far the easiest curling operation, because the direction of burr on the cut edge and the direction of flare on the edge as drawn in a single-acting die are away from the curling punch. This condition is favorable to curling. If the shell were blanked and drawn in a double-acting die, the burr would be inward toward the curling punch, but as the flare of the edge would be outward, there would still be no difficulty.

The direction of burr is extremely important in curling. If the burr is toward the curling punch, the sharp edge digs into the punch and resists curling. This difficulty may be overcome by turning the edge, as shown at (b), in a separate operation.

If the cup is shallow, as shown at (c), so the side wall receives support from the end wall of the shell, the inward curl may be made in thin metal without previous turning of the edge. But if the shell is deep, view (d), the edge must be turned in a previous operation

1 Shell edges may be curled by pressing or rolling. Direction of burr and flare affects curling and may require turning the edge inward in a separate operation to avoid gouging into the curling tool



and the inside wall of the shell must be supported to prevent collapse of the side walls. At (d) the work is supported on the outside by a pocket, or nest, in which it rests, and on the inside by a expanding punch.

View (e) shows curling by rollers in a rotating chuck. The curl may be outward or inward, but if it is inward the burr should be inward or the edge should be turned in. No support is required on the inside of the can, because the end pressure of rolling is not great.

When the curl is on the interior of the work, as shown in Fig. 2, instead of on the periphery, the conditions for curling are different. Inward curling on an interior flange is the easiest, because the direction of flare is inward, as shown at (a). Outward curling on an interior flange is more difficult, because the stock is apt to crack, so the edge must be cut clean and not ragged.

When the curling groove in the tool is too large, the curl forms, view (b), to its own smaller diameter. The groove in the curling tool and the curl should therefore be the same diameter, which depends on the thickness of the stock. Curls for stock 0.010 in. in thickness are usually about 1/16 or 5/64 in. in diameter, and for 0.018-in. stock about 1/8 or 3/16 in.

Fig. 3 shows a die for curling a can cover with an outward curl. The die is built as outlined in Fig. 1 (a), so the direction of burr and flare of the cut edge are favorable for curling. The work is supported on the outside by a pocket in the die and on the inside by the heel of the curling punch which enters the shell deeply. The curling punch of oil-hardening steel, 56 to 58 Rockwell C, is made smooth and without undercut. Design details are:

1. The curling groove is in the punch instead of the die. As this allows scrap to drop from the curling punch, there is less chance of damaging the die. This construction also permits work to be fed to the die with the open end up, which is the easier way for the operator.

2. Design details for the preferred type of knockout show that it strips the work from the punch and a spring pin then pushes the work from the knockout in case of adhesion from the oil film. The knockout is spring-counterbalanced, so the work will not be knocked out prematurely when picked up by the punch. Two air holes are provided in both punch and die.

3. The design provides accessibility for driving the work from the die in case of jamming and for adjusting the spring tension or replacing broken springs. A lifting plate in the pocket of the die is held up by pins that extend through the die to a pin plate, which may be driven upward to remove jammed work from the die. The pin-plate spring can be adjusted for tension or easily replaced if it breaks. If the lifting mechanism were inside of the die, it would be far less accessible.

Bulging Prevented by Design

Fig. 4 is a die for inward curling an 11 x 18-in. rectangular tray. The curl is made without turning in the edge and without inside support for the side wall. A center block supports the entire tray including the area under the curl.

The work is held down firmly on the center block by a pressure pad in the punch. The pressure pad should clamp the work before the punch curls the edge and as close to the curl as possible to prevent it from backing up and forming a bulge between the curl and the pressure pad. If the curling punch does not fit the work, being either too loose or too tight, or if the pressure pad does not clamp the work before curling starts, the curl will back up and bulge.

The curl will also back up if there are any high spots on the flange, because the flange will bend inward at these spots before curling starts evenly at other points on the flange. The flange must be of even height and just high enough to provide material for a full curl. If there is too much material, the metal wil back up and bulge, while if there is too little material, the edge will wrinkle because the curl will not fill the punch.

As the bottom of this tray is drawn tight in the drawing operation, it will be buckled from the internal tensile stress. The tension can be relieved so the tray will lie flat by drawing the tray 1/64 in. deeper than the finished article and bumping it down in the curling die.

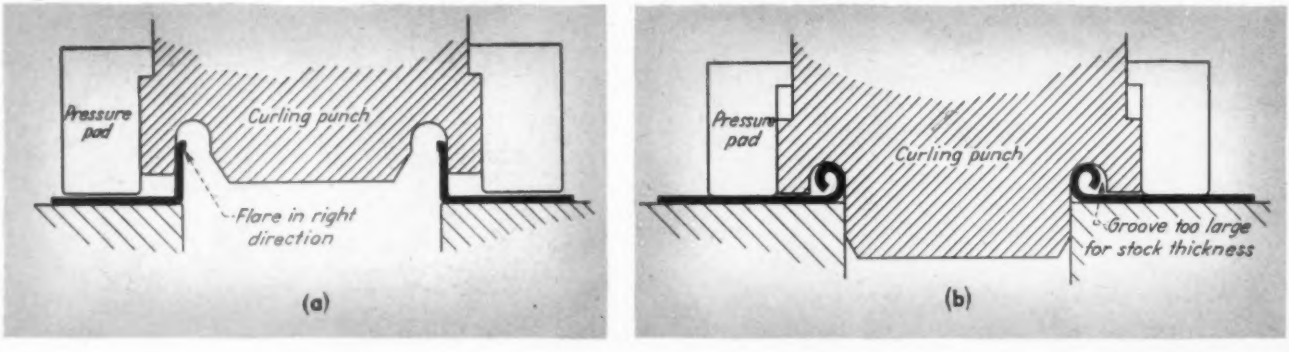
The punch is built with straight sections on four sides and corner sections machined from circular stock cut into quarters. This construction permits fitting the curling punch accurately to the work and grinding the straight sections.

Rubber suction cups lift the finished tray from the die after spring pins have given it a start. A positive knockout strips the work from the suction cups at the top of the press stroke.

Fig. 5 shows a die for inside curling of a deep shell wherein the curl is spaced away from the bottom of the shell as in Fig. 1 (d). The curl has been started inward in another operation, and inside expanding support is necessary. The outside of the shell is supported in a pocket in the die.

The expander opens for inside support before the curling punch engages the work. It is opened by a tapered plug backed up by a heavy spring that yields to provide dwell for holding the expander open while the curling punch descends. The spring is a safety device also, in case two shells are fed into the die

2 Inward curling (a) on an interior flange is easier than outward curling (b), because the stock is less likely to crack. For either, the groove size depends on the stock thickness



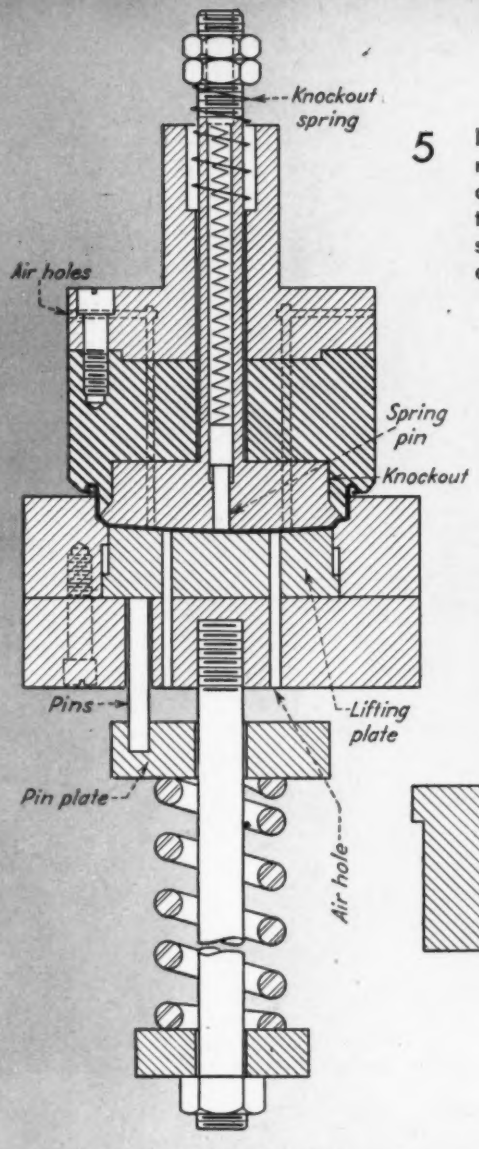
at the same time. The expander slides on the top surface of a supporting plug, the lower surface of which is domed to fit the work.

On the upstroke of the press, the curling punch rises first to clear the work, then the expander collapses as a light coil spring forces it downward against tapered surfaces on the inside of the punch. The work is stripped by the supporting plug as it is forced down by a central spring.

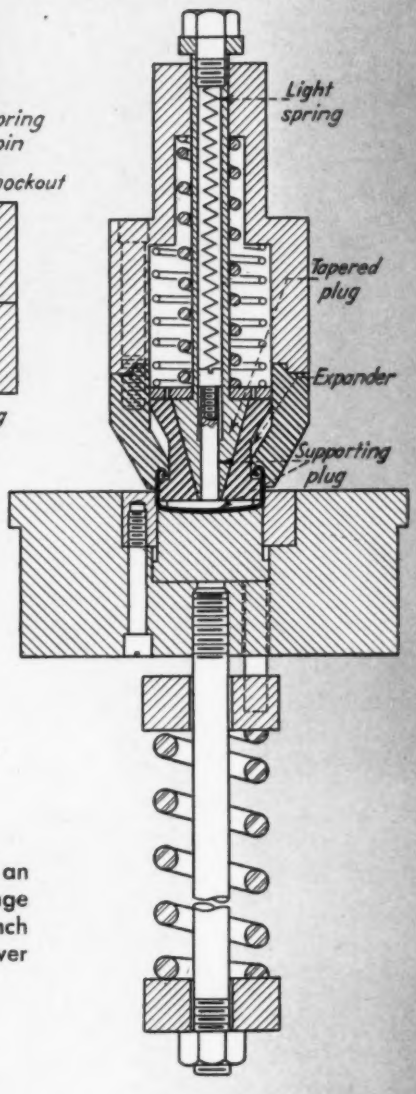
The details of an adjustable three-roller curling chuck for deep shells or cans are shown in Fig. 6. An adjustable feature, whereby the rollers may be moved in or out from the center of the chuck, permits altering the diameter of work, as for cover fit on a can. A disadvantage of roller curling is that it is more apt to burn lithographed stock than is press curling.

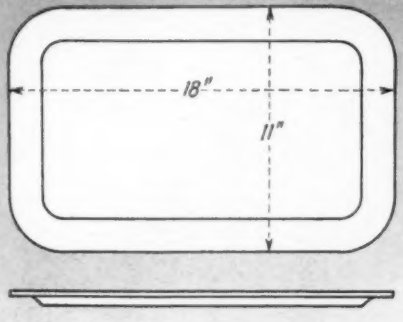
Second-Operation Beading Dies

Beading may be performed by expanding tools, by rolling, or by pressure applied to the end of the shell. Beading by end pressure is facilitated by any break in the continuity of the side wall of the shell which weakens it, as by an offset, and by supporting the shell all over except



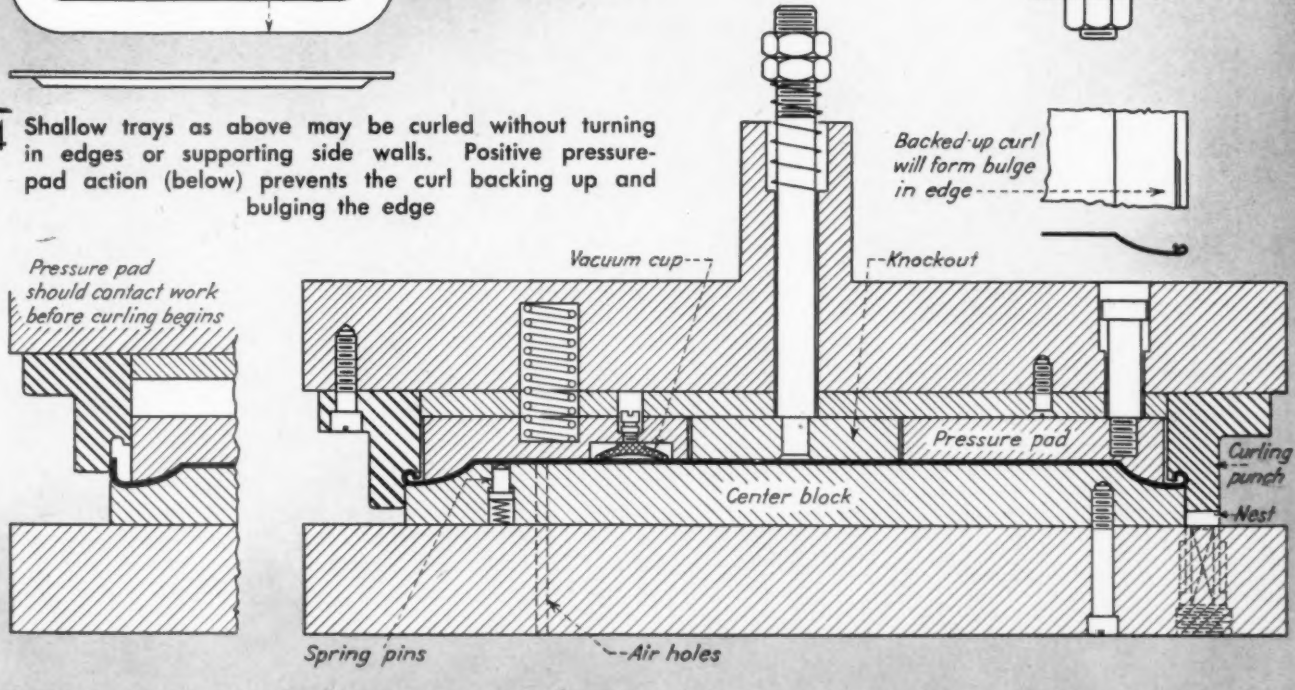
5 Inward curling of a deep shell requires inside support from an expander opened by a tapered plug and collapsed by spring pressure, forcing it against outer tapered surfaces

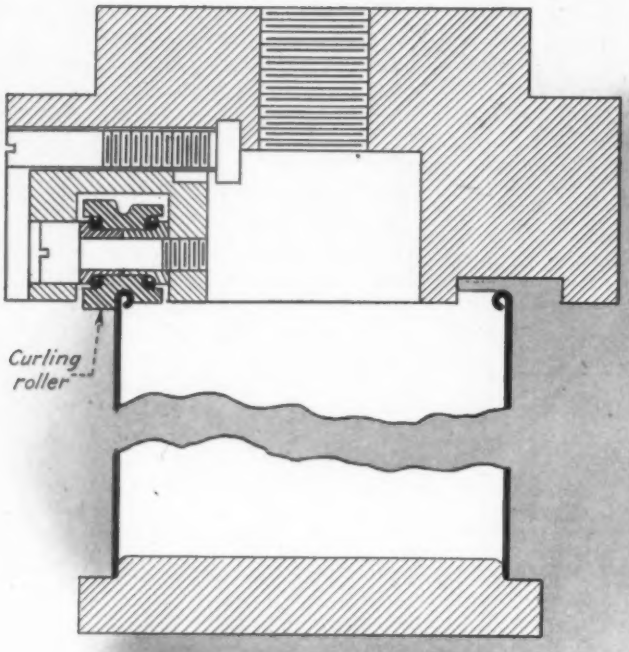




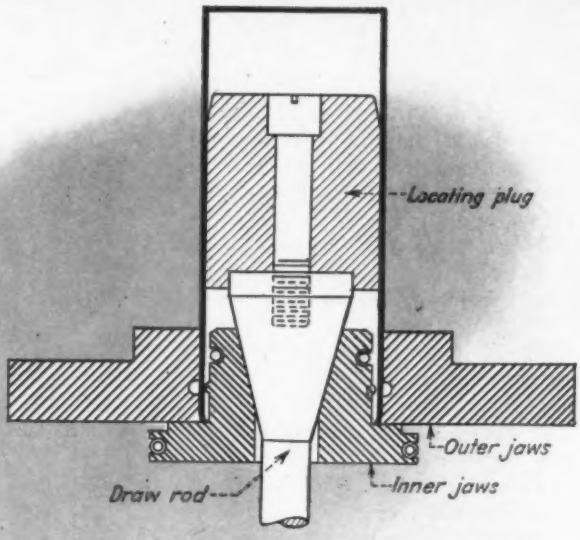
3 This second-operation die forms an outward curl on the exterior flange of a can cover. Grooving the punch permits feeding the formed cover with open end up

4 Shallow trays as above may be curled without turning in edges or supporting side walls. Positive pressure-pad action (below) prevents the curl backing up and bulging the edge



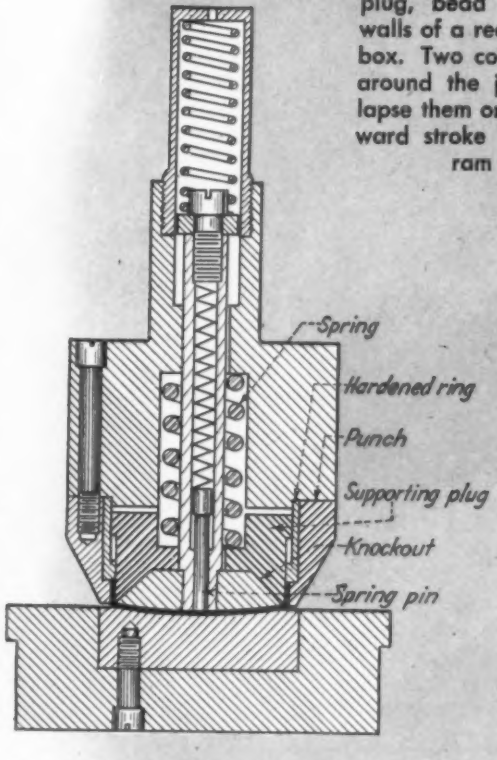


This roller chuck for inward curling is made adjustable to permit slight variations in diameter

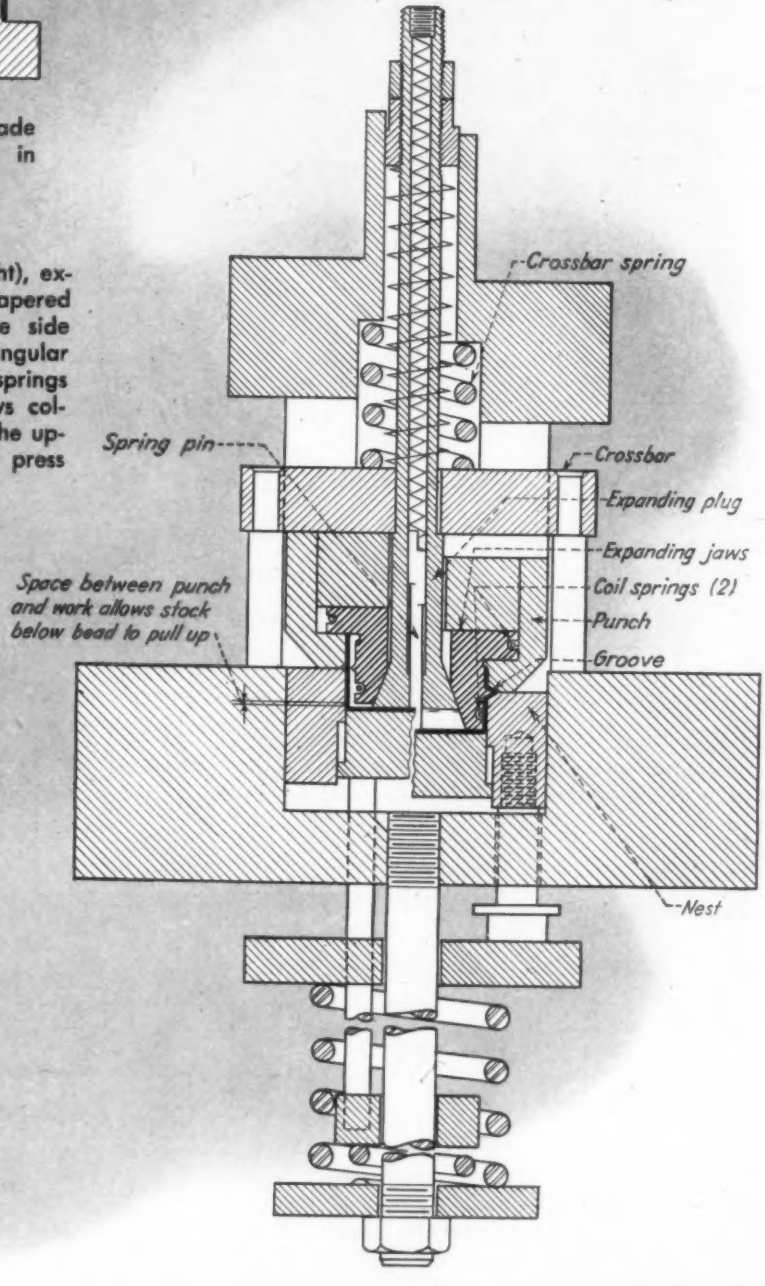


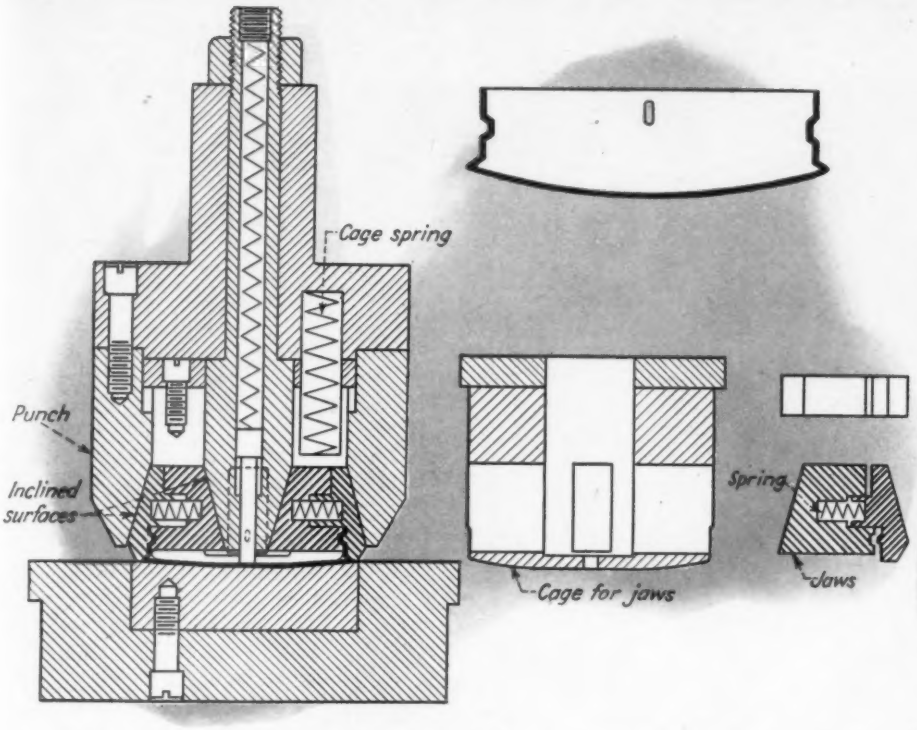
7 Beading on squeeze beaders is done by forcing outer jaws to support the work before inner jaws form the bead

8 Inner jaws (right), expanded by a tapered plug, bead the side walls of a rectangular box. Two coil springs around the jaws collapse them on the upward stroke of press ram

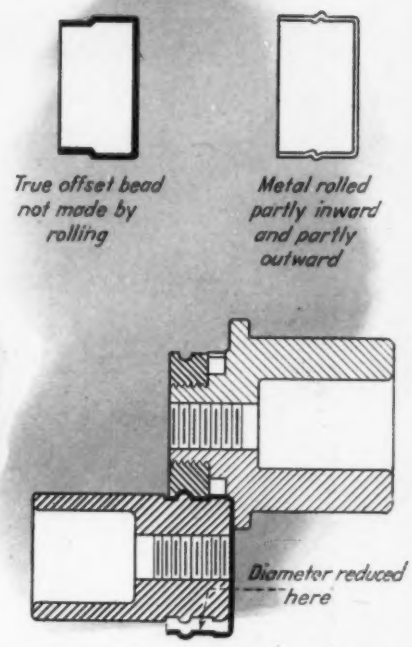


9 Beading by end pressure requires positive confinement inside and outside the shell walls to prevent buckling while the corner metal rolls outward to form the bead





10 This nib-forming die has interlocking jaws, actuated by inclined surfaces on the punch and center plug. A cage enclosing the jaws is forced downward by springs to separate the jaws after the nib is formed but before the punch ascends



11 Rolling does not form true offset beads. It also may reduce shell diameter, making it necessary to draw the shell larger in the first operation

at the weakened section while end pressure is applied.

Expansion tools commonly employ an inner sectional member which is expanded by a tapered plug and an outer supporting member which closes around the work. Fig. 7 shows segmental outer jaws which close in radially on the work, while Fig. 8 shows a pocket in the punch which closes over a nest in the die.

An important principle in beading tools for outward beads is to have the outer supporting members close around the work before the inner jaws expand as otherwise the drawn shell may split.

The tool in Fig. 7 is for beading in a special machine, known as a squeeze beader, which forces the outer jaws inward and then expands the inner jaws by draw-rod pull on the tapered plug. This basic mechanism may be incorporated in a die by supplying means for moving the outside jaws and the draw rod.

Fig. 8 is a die for beading a rectangular box. The stamping is pushed into a nest grooved in its upper surface to receive the bead. The punch nest and inner expanding jaws descend together. A tapered expanding plug attached to an upper crossbar is limited in its downward movement by crossbar pins striking stationary parts of the die and the jaws are expanded by movement along inclined surfaces of the tapered plug. A coil spring above the crossbar provides safety against breakage in case of jamming.

Another beading principle has been incorporated in this die. Because the stock might tear if the metal in the bead were drawn entirely from the top of the box over the sharp edge of the beading jaws, a space has been provided between the bottom of the box and the bottom of the beading jaws so the stock for the bead may be pulled upward, as well as downward.

Two coil springs wound around the punch pull the expanding jaws in on the upward stroke of the press. The work is stripped from the punch by the expanding plug and pushed off the jaws by a center spring pin.

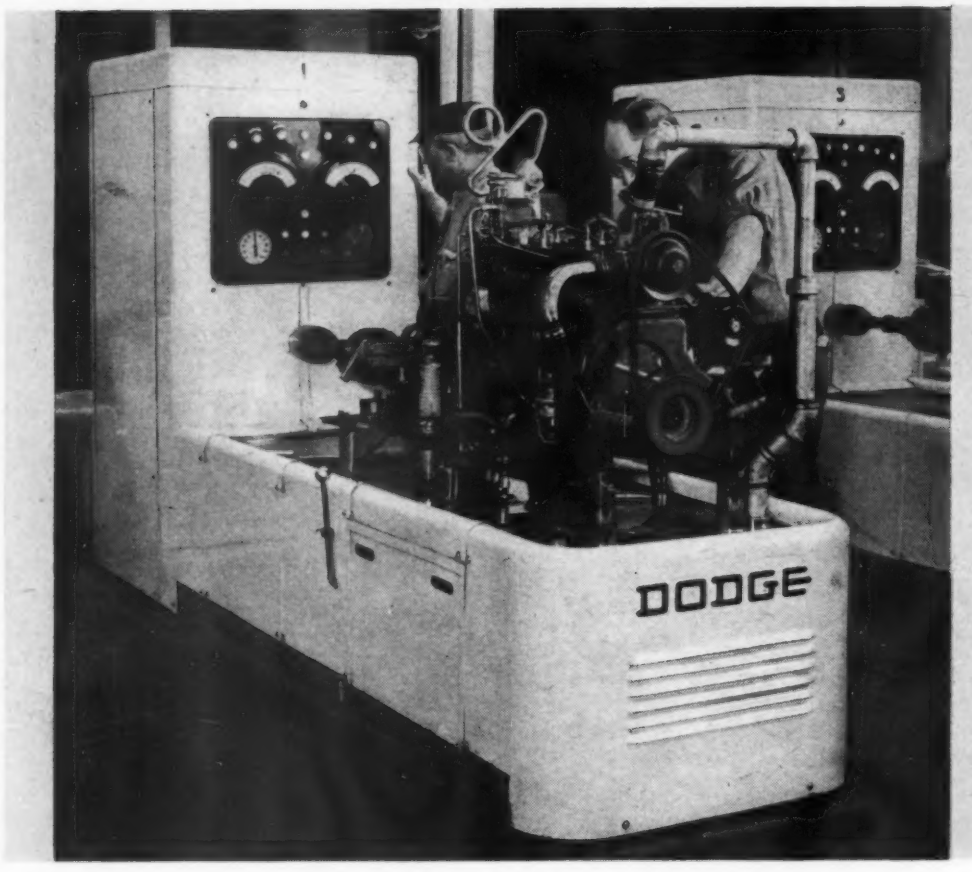
Fig. 9 shows a tool for beading a can cover by end pressure applied while the cover is confined both inside and outside. The metal in the corner of the work rolls outward to form a bead. Inside support is provided by a plug backed up by a coil spring. The plug enters the cover before the punch comes down over the outside, and pressure is applied by a hardened ring between the punch and supporting plug. On the upstroke of the press, the work is forced from the punch by the supporting plug, stripped from the plug by a positive knockout and then pushed from the knockout by a spring pin.

Sizing tools for reducing the outside of the work to slightly smaller diameter may be built on the same principle by omitting the hardened pressure ring. Reducing tools for even greater reduction in diameter require inside expanding support.

Nibs, which may be formed by dies or by rolling, are formed in Fig. 10 by interlocking jaws separated by springs within the jaws. The outer jaws are forced inward to forming position by inclined surfaces engaging similar inclined surfaces on the punch, while the inner jaws are forced outward by a central tapered plug. Housed in rectangular slots in a cage which slides up and down in the punch, the jaws are released by coil springs forcing the cage downward after the nib is formed.

Fig. 11 shows rollers adaptable to beading or threading. Rolling does not form a true offset bead, but forces part of the metal outward and the adjacent part inward. Rolling of two outward beads may even reduce the diameter of the work between the beads, so it becomes necessary in the first operation to draw the shell to a larger diameter to compensate for the shrinkage.

The drawings shown here are for single-purpose tools, but combinations are possible and practical. Thus, curling and nib forming, for example, can be combined with beading to produce efficient and economical tooling.



ENGINE SPEED is governed by an automatic throttle, which consists of a solenoid-operated valve and hydraulic unit attached to throttle level. When engine reaches speed for desired load, piston movement is stopped by an electronic overload unit, and engine runs steadily

Electronic Robot Tests Dodge Engines

BY RUPERT LE GRAND
ASSOCIATE EDITOR

IN PLACE of usual dynamometer tests and routine adjustments, Dodge Division, Chrysler Corporation, is now using an electronic test stand to make sure that the engine, clutch, fluid coupling and transmission assembly unerringly meet specified performance standards. The advantages of the electronic stand (designed and built by Dodge) are:

1. The human element is overcome —no necessary test or adjustment can be overlooked before the power plant is installed in the automobile.

2. Each test must be consummated within specific performance limits.

3. The quality of work done on the engine assembly line is checked. A missing thermostat, for example, will be detected.

4. Purchased parts and assemblies are inspected 100% for performance. Thus, defective components are detected before they can reach the customer, and at less expense than would otherwise be possible. Suppliers are informed of the reasons for rejections, thereby leading to quick corrections.

5. The operator is required only to load and unload the test stand, and he can operate three of them. The test stand runs through its cycle automatically. If a defective condition is uncovered, a red light flashes on, requiring a roving inspector to analyze the trouble, make adjustments or order repairs. Meanwhile, each operator proceeds with loading and unloading the three machines under his care, in contrast with the former requirement of ¾ hr. to make connections and 1 hr. to test an engine.

In recent years, it has become practice to test the entire "rotating" assembly—engine, clutch, fluid coupling (where used) and transmission—as a unit. Thus, the test stand is designed to uncover defects in: carburetion, fuel pump, ignition, starter, transmission, fluid coupling, clutch, distributor, spark plugs, plus leaks, high or low oil pressure, low horsepower, and motor roughness, plus missing items.

The engine testing sequence is (lights on panel indicate stage of testing, refer to tabulation.):

1. Place engine on stand, make connections for ignition, starter, gasoline and oil supply, oil drain, water and exhaust, and couple engine to generator.

2. Check engine timing by light on control board, the light being connected in series with the ignition system.

3. Close ignition switch, thus energizing these circuits:

(a) 110-v. supply for control and operation of test equipment.

(b) sequence timer that opens a solenoid valve, permitting oil to flow through engine oiling system and out drain in bottom of oil pan.

(c) solenoid-operated valve that supplies water to cooling system.

(d) solenoid-operated valve closes, permitting cooling system to fill.

4. Pressure-operated switches in the oil and water lines, are connected in series in ignition circuit, prevent starting engine without oil or water pressure. When pressure is built up in lubrication and cooling systems, these switches close, permitting the engine to be started.

5. Engine is started and throttle lever is connected to automatic, hydraulically operated throttle control, a feature of the test stand. Transmission is shifted to high and engine speed set at 500 rpm. Engine speed is shown on control board by electronic indicator operated by impulses of engine ignition system.

6. Close switch for motor-driving sequence timer. This control allows engine to run at 500 rpm. for 5 min. Make engine adjustments.

7. After engine runs at 500 rpm. for 5 min., the sequence timer closes throttle control circuit, accelerating engine speed to 1200 rpm.

8. When the engine speed reaches 1200 rpm., a relay in the circuit used to indicate engine speed closes a solenoid-operated contactor, connecting the inductor generator to a 440-v. line. The throttle continues to open until the engine is running at a speed comparable to one-half load. Current from the inductor generator controls an electronic overload unit, which is set to operate at current equivalent to one-half engine load. The overload control unit operates a relay with two circuits—one with normally closed contacts; the other with normally open contacts. When the relay operates, the normally closed contacts open, causing the oil-feed valve in the throttle to close, thus holding the throttle at a position which maintains one-half load on the engine. When the open contacts close, a light on the control board indicates that one-half load has been reached.

9. After 10 min. of operation at one-half load, the sequence timer closes the solenoid-operated drain valve in oil pan, permitting the oil pan to start filling to normal operating level.

10. Two minutes later, the sequence timer opens the circuit in the oil-feed valve, causing it to close and shut off the oil supply.

11. Engine performance is checked during these 12 min.

12. At the end of the 12-min. period, the sequence timer causes the throttle to accelerate the engine to full load.

13. After 3 min. at full load, the sequence timer opens the circuit of the solenoid-operated contactor, disconnecting the inductor generator, and returns the throttle to idling speed of 500 rpm.

14. If an engine fails to develop full power, a relay energizes circuits that open the oil drain valve and close the throttle, cause a light on the panel board to indicate rejection, disconnect the inductor generator from the 440-v. line, open the 110-v. control circuit for engine test conditions. The last circuit is interlocked, so that an authorized inspector must insert a key that sets the sequence timer 2 min. ahead of starting a full-load test, so the entire test cycle need not be repeated.

15. A final test for proper operating conditions is made, the throttle control mechanism is removed, the engine speed is set at 500 rpm., the 110-v. control circuit is opened, the connections are removed and the accepted engine is removed from the test stand. The sequence timer returns the control equipment to the starting position and stops, ready for testing another engine.

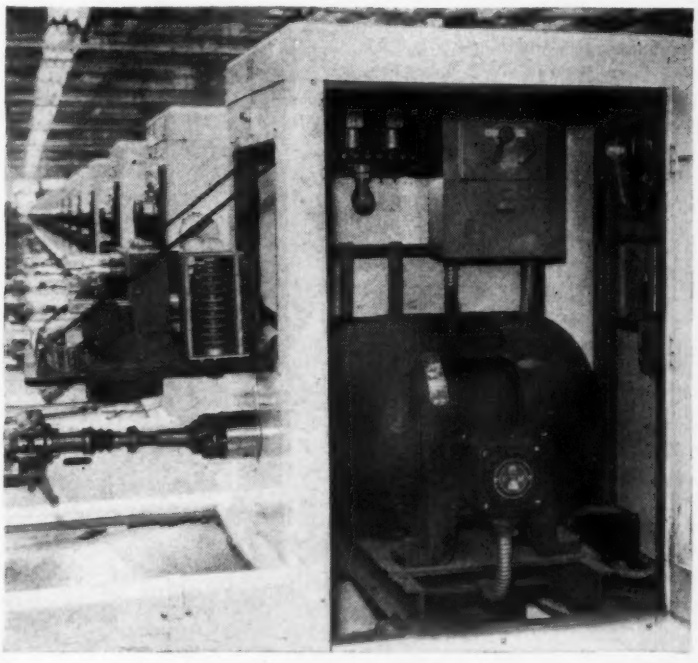
To prevent an engine from racing with throttle open at no load, if the inductor generator is not connected to the line, or for any other reason, an overspeed relay shuts down the test stand. Testing can not be resumed unless the electrically interlocked circuit is reset with a key.

Another feature of these test stands is that, when the engines are running at half and full loads, the a.c. motors are driven over their rated synchronous speed, and thus return about 510 kwh. per hour to the shop power line.

Dodge has installed a large number of these test stands in a well-lighted, clean testing department.

WHAT PANEL LIGHTS INDICATE

LIGHT NO.	COLOR	CONDITION
1	Red	Power on test stand
2	White	Ignition timing properly set
3	White	Ignition current on stand
4	Purple	Engine test current on stand
5	Green	Throttle valve operating
6	Amber	Oil circulating through engine
7	Blue	Water circulating through engine
8	Amber	Engine starting testing cycle
9	Purple	Engine being put under load
10	Green	Engine operating at half load
11	Amber	Oil drain valve closed, crankcase fills to operating level
12	Blue	Engine operating at full load
13	Red	Only when engine is rejected



FOR EASY SERVICING of test stand, the electronic panel swings out for adjustments. Sequence timer is seen at upper left in cabinet

Should Machine Shops Be Decentralized?

BY BENJAMIN P. HAMILTON
INDUSTRIAL ENGINEERING UNIT, RCA, VICTOR DIVISION

The trend to centralizing of activities within a plant may lead to inefficiency, higher costs. RCA saved by splitting its large machine shop into units serving separate divisions

REDUCED COSTS of fabricated metal parts, shorter ordering cycles, improved production control and less transportation expense are among the advantages obtained since splitting a large centralized machine shop among the three major product divisions of RCA Victor's Camden plant.

Each RCA product division operates essentially as a separate business with its own sales engineering, manufacturing and financial departments. The electronic-equipment division is by far the largest of the Camden product divisions, occupying building areas of some 1,650,000 sq. ft., as compared with 250,000 sq. ft. for the parts division and 200,000 sq. ft. for the record division. Its business and personnel are proportionately the largest of the three.

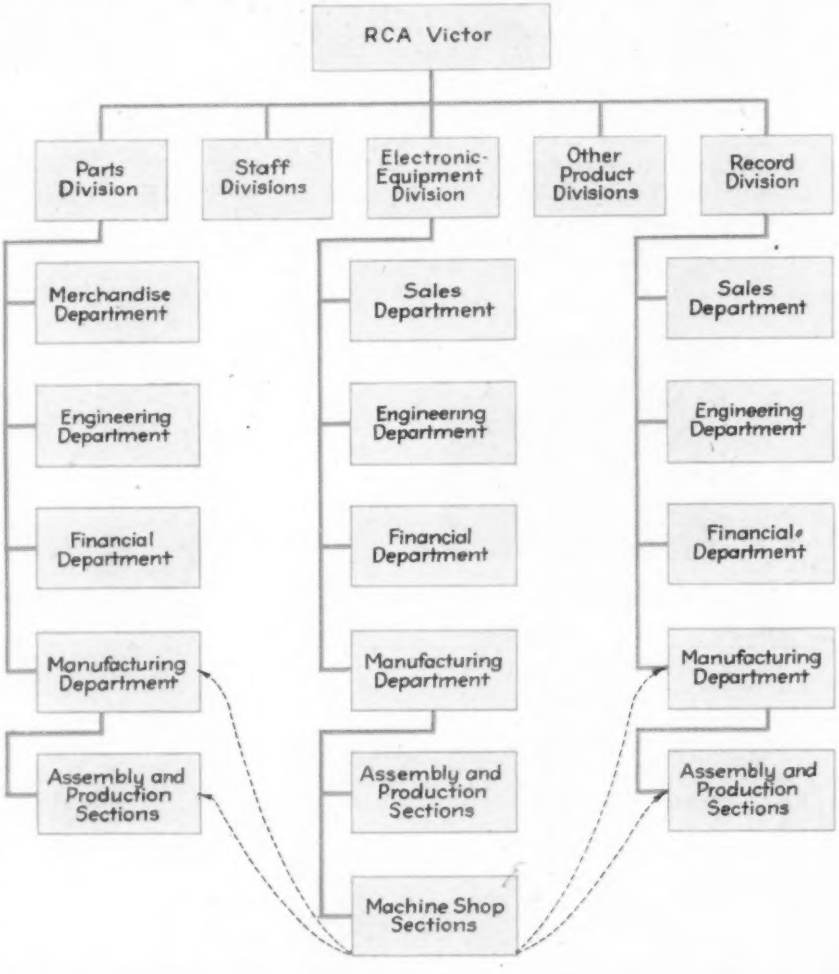
With the previous organization, the parts and record divisions bought metal parts from the electronic-equipment division. This division operated an extensive machine shop employing approximately 1,400 persons. Shop activities were divided into punch-press, screw machine, tool-shop and general machine-shop centers.

The chief function of the electronic-equipment division, however, was the manufacture of electronic apparatus including radar, AM, FM and television transmitters, police radio, movie projectors and other specialized equipment. The centralized machine shop was the source of tools and parts for its own equipment, these requiring about 75% of shop capacity, and also supplied the parts and record divisions with their tools and metal parts.

The parts division used metal parts such as transformer cans, speaker housings and common items such as screws, nuts and washers. It also used large quantities of tools in the molding and forming of plastic items. Parts and tools were manufactured by the electronic-equipment division in its central machine shop. The record division needed a smaller variety of tools, all of which were used in the pressing and forming of phonograph records and were likewise supplied by the central machine shop.

Disadvantages of Decentralization

When decentralization was first proposed it was contended that the centralized machine shop supplied



RCA Victor former organization chart shows a centralized machine shop, under the electronic-equipment division, supplying fabricated parts and tools to independent divisions. Decentralization placed a machine shop under each division

the required metal parts and tools at minimum cost and that splitting the shop would be accompanied by serious disadvantages. These possible disadvantages of decentralization considered may be summarized as follows:

1. *Increased investment in machinery and equipment:* In certain instances, such as where fractional usage of a particular facility unit is required in each of two or more product departments, more equipment may be needed. Also, to provide for contingencies and variations in load, the total number of units required by two separate groups is greater than that required by a single consolidated group.

2. *Increased number of supervisory and technical personnel:* When machine-shop facilities are located in machine centers, each would have a foreman and an assistant foreman. Separation of these centers requires a minimum of one foreman or assistant foreman for each center in the two smaller divisions. At the same time, the former decentralized machine shop retains its foremen and a large number of assistant foremen.

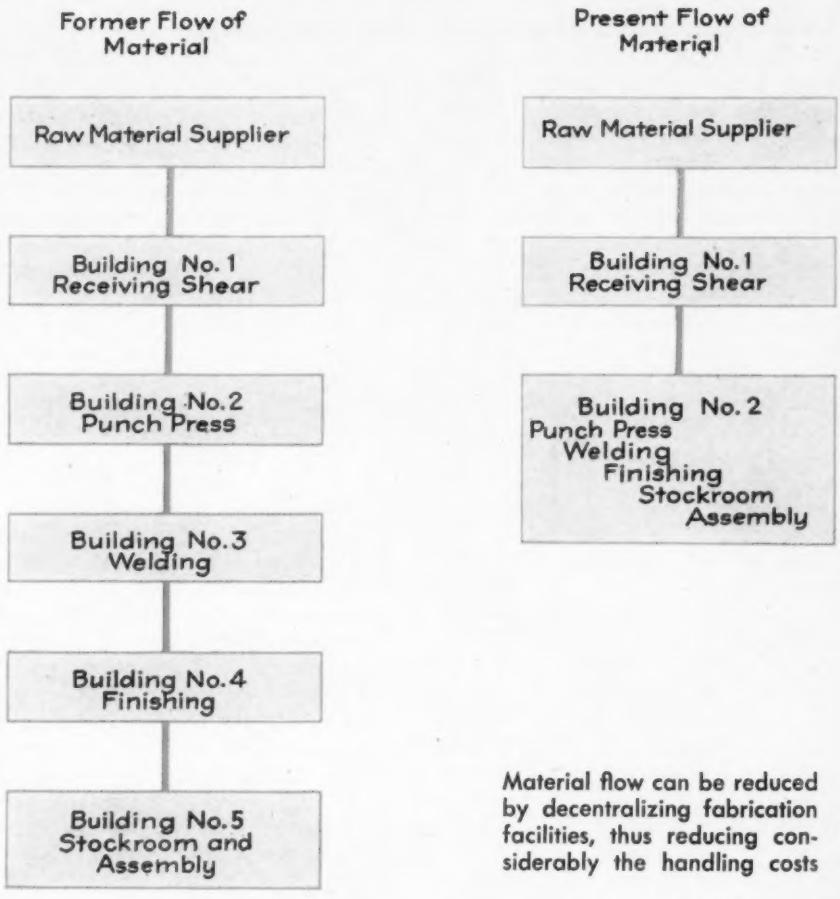
Process (operation sheet writing), time-study and production-control activities are performed by groups in each of the separate divisions. Depending on the load in each division, this can increase personnel requirements by duplication of work performed and by need of the services of fractional persons.

3. *Labor inefficiencies:* Separation of machine-shop activities in separate organizations may result in direct-labor inefficiencies arising from unbalanced production. Excess loads of one division may require direct-labor overtime, while in the centralized machine shop, operators can be shifted to meet this unbalanced production, removing the need for overtime. Likewise, slack periods cause operator idle time and incomplete direct-labor utilization. Under centralized operation, this condition is to a certain extent avoided.

4. *Less skill developed in decentralized shops:* All other things being equal, a single shop employed in fabricating a variety of items develops a higher grade of skill than two smaller shops engaged in fabricating the same items. This results from the larger number of improvements normally stemming from the wider experience of the larger shop.

5. *More labor difficulties:* Labor dissatisfaction involving labor union action may be expected where two fabrication groups, operating under independent divisional management, are located in the same plant. This can take place where different wage or incentive rates are applied to identical work.

6. *Duplication of tools, processes and setups:* When the same parts are required by two or more divisions, duplication of facilities will occur.



Material flow can be reduced by decentralizing fabrication facilities, thus reducing considerably the handling costs

Decentralization Advantages

Despite the foregoing disadvantages, a complete analysis of our problem showed that decentralization of machine-shop activities was desirable and prompted establishment of a machine shop under the manufacturing department of both parts and record divisions. The major advantages that were found to weigh heavily in favor of a decentralized shop and that have been realized since decentralization are:

1. *Reduced metal-parts ordering cycle:* By avoiding the double ordering required by operation of the centralized shop, the ordering cycle was reduced by one to two weeks for repeat orders and longer periods for new orders. This occurred as each RCA product division issues orders to its own manufacturing floor and orders between divisions are treated as any order from an extra-company customer. Thus, with the centralized shop, orders for metal parts were processed through the ordering systems of two product divisions, whereas, with the decentralized shops, one ordering cycle alone is required.

2. *Reduced fabrication cycle on rework or extra-operation parts:* Parts originating in the record or parts divisions requiring operations, such as finishing, added machine-shop or press-shop operations, or rework in the case of rejected parts, also cleared through the paperwork systems of both the originating product division and the centralized machine shop of the electronic-equipment division. For example, with the centralized shop, these parts were sent by the division accumulation stockroom to a central fabrication hold room, then routed to a machine-shop section.

3. *Reduced fabrication cycle on all other fabricated parts:* The fabrication cycle for new orders worked by the centralized shop was 8 to 9 weeks, and for repeat orders 4 to 6 weeks. This cycle, even on repeat orders, was long, because the large machine shop operated on a shop-order basis, filling orders for each of the three product divisions. Each order awaited its turn, and in certain cases orders from the outside product divisions more than awaited

their turn. A functioning group, servicing several operating groups and reporting to one of the serviced operating groups, almost invariably provides the latter group with the best service. Decentralization reduced the fabrication cycle on both new and repeat orders.

4. *Less setup expense:* Decentralized shops operate with less setup expense under two conditions:

(a) Where small- and medium-sized lots of a single part were made by the centralized shop with a separate setup for each lot and where, with separate product department operation of the decentralized shops, the original setup can be retained on a machine segregated for that purpose.

(b) Where large lots of a single part were made by the centralized machine shop and the run is interrupted and a separate setup required to accommodate parts for another product department. The decentralized shops do not meet interruptions of this type.

5. *Reduced material transportation expense:* Decentralization of a shop serving about 50 acres of floor space, as did the former centralized electronic-equipment machine shop, will produce economies in material-transportation expense. An example of the reduced number of buildings that material must flow through is outlined in the accompanying flow charts. The required routing from floor to floor and from building to building in the first chart is typical of the routings that occurred with a centralized machine shop. The present flow of material shows the routing that is now obtained when metal parts are made by the individual product divisions, each with its separate machine shop.

6. *Improved production control obtained at lower cost:* With the previously centralized shop each outside division maintained continuous expeditor contact with the machine shop. Now the separate product divisions, each with its own machine shop, control the production of tools and metal parts with progress charts and with other production-control records, thereby eliminating a major expediting expense. Total savings in wages and salaries amount to several thousand dollars annually. In addition, the reduction of indirect expense is concurrent with improved metal-parts supply. For example, in the production of terminal boards, the average number of items in short supply has been rduced from 160 to 0, following decentralization. Similar improvements in production-control performance are now being experienced with other items.

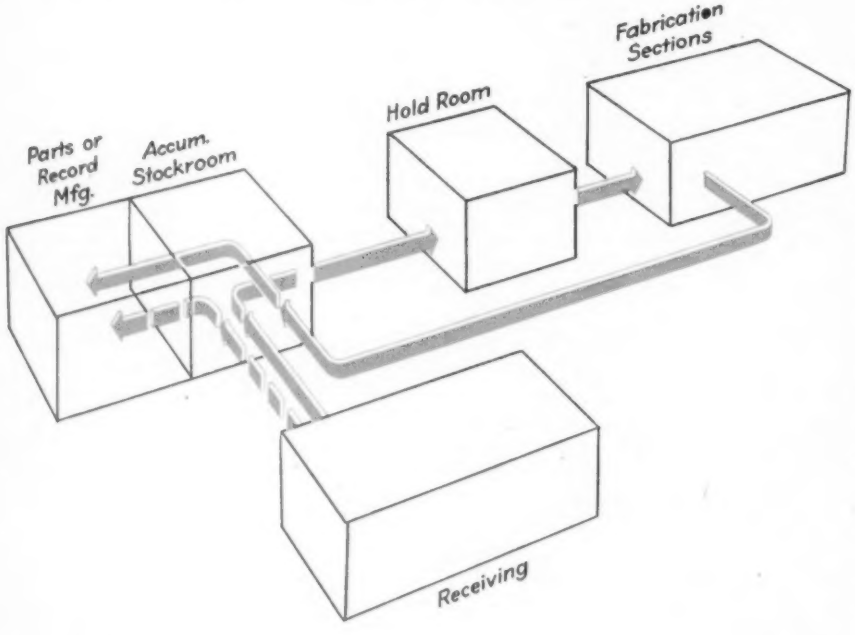
7. *Improved service on sales and engineering samples:* The RCA parts division often requires metal parts for sales and engineering samples, these parts usually being ordered in quantities of 1 to 25 units. The orders do not result from scheduled production and are frequently required in 1 or 2 days with a maximum of 7 days to meet sales and engineering demands. Every effort is made to make rapid delivery of these samples, because customers place orders for sample components when their equipment is in the design stage. If the sample component is not supplied readily, the customer may turn to a competitor for service. Failure to fill sample orders can result directly in loss of large production orders, because slow delivery of sample orders can lead customers to believe that production orders would meet similar delay.

With the centralized machine shop, frequent delays occurred in the delivery of metal parts for these sales and engineering samples. The larger shop, under the control of the electronic-equipment division, found it difficult to appreciate their importance, in quantities of 10 or 20, and and gave more attention to large orders. As a result, the majority of small-quantity orders required more than 7 days delivery time and some orders required 30 days time. In this case, operation of the decentralized shop has reduced the number of small-quantity orders in short supply to an all time low of four to six.

8. *Decentralized shops bring better conformance with the principles or organization:* Based on standard principles of organization, all supporting fabrication activities should be performed, organizationally and physically, as close as possible to the manufacturing division producing the final operating unit or equipment. In this case, the activity will give quicker and greater volume of production per man when it reports to the manufacturing head receiving the service. The division head responsible for manufacturing the final unit has full control and also full responsibility. He must coordinate or accept criticism for performance. Harmony and cooperation is more easily achieved when the supporting activity is under the same direction as the manufacturing division.

9. *More accurate product costs are*

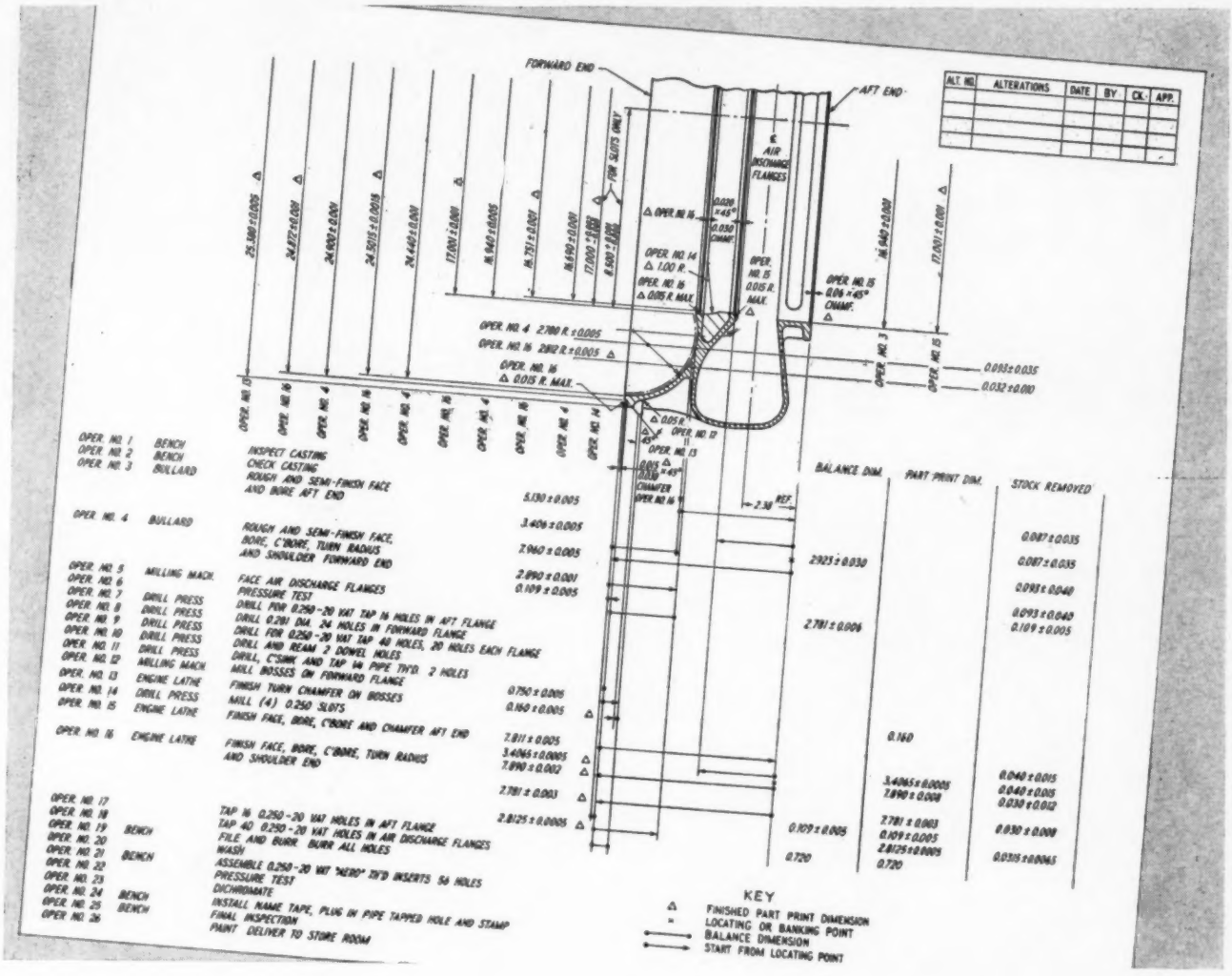
Purchased parts requiring additional fabrication can be routed direct to stock room and product division with separate machine shops. Centralized shop requires routing to hold room to insure delivery to proper fabrication section, resulting in longer cycle



obtained: In general, product costs of improved accuracy are possible when all supporting manufacturing activities are separated organizationally by product line. More accurate costs are obtained where the manufacturing activities related to the product line are organizationally separate from other manufacturing and their full cost and no other cost is charged. Where costs must be segregated by shop orders, as occurs with organization into separate manufacturing groups, there is room for discrepancy in reporting day work and various charges, and the overhead charged is necessarily an estimated, not an actual rate.

10. *Separate product divisions obtain improved control of their fabricated-parts cost:* The improved control of fabricating cost occurs where each product division, by operating its own machine shop, directly controls this activity and insures that it remains competitive with outside vendors.

Each division has gained control of metal-parts cost to the extent that it does not, through lack of control over the segment of costs that the machine shop represents, lose orders valuable to its product business.


FORWARD END
AFT END
ALT. NO. ALTERATIONS DATE BY CK. APP.
6 AIR DISCHARGE FLANGES
OPER. NO. 1 BENCH INSPECT CASTING
OPER. NO. 2 BENCH CHECK CASTING
OPER. NO. 3 BULLARD ROUGH AND SEMI-FINISH FACE AND BORE AFT END
OPER. NO. 4 BULLARD ROUGH AND SEMI-FINISH FACE, BORE, C'BORE, TURN RADIUS AND SHOULDER FORWARD END
OPER. NO. 5 MILLING MACH. FACE AIR DISCHARGE FLANGES
OPER. NO. 6 PRESSURE TEST
OPER. NO. 7 DRILL PRESS DRILL FOR 0.250-20 VAT TAP IN HOLES IN AFT FLANGE
OPER. NO. 8 DRILL PRESS DRILL 0.201 DIA. 24 HOLES IN FORWARD FLANGE
OPER. NO. 9 DRILL PRESS DRILL FOR 0.250-20 VAT TAP 40 HOLES, 20 HOLES EACH FLANGE
OPER. NO. 10 DRILL PRESS DRILL AND REAM 2 DOWEL HOLES
OPER. NO. 11 DRILL PRESS DRILL, C'SINK AND TAP 1/4 PIPE TH'D. 2 HOLES
OPER. NO. 12 MILLING MACH. MILL BOSSES ON FORWARD FLANGE
OPER. NO. 13 ENGINE LATHE FINISH TURN CHAMFER ON BOSSES
OPER. NO. 14 DRILL PRESS MILL (4) 0.250 SLOTS
OPER. NO. 15 ENGINE LATHE FINISH FACE, BORE, C'BORE AND CHAMFER AFT END
OPER. NO. 16 ENGINE LATHE FINISH FACE, BORE, C'BORE, TURN RADIUS AND SHOULDER END
OPER. NO. 17
OPER. NO. 18
OPER. NO. 19 BENCH TAP 16 0.250-20 VAT HOLES IN AFT FLANGE
OPER. NO. 20 TAP 40 0.250-20 VAT HOLES IN AIR DISCHARGE FLANGES
OPER. NO. 21 BENCH FILE AND BURR BURR ALL HOLES
OPER. NO. 22 WASH
OPER. NO. 23 ASSEMBLE 0.250-20 VAT "HELI-COIL" TH'D INSERTS 56 HOLES
OPER. NO. 24 BENCH PRESSURE TEST
OPER. NO. 25 BENCH DICHROMATE
OPER. NO. 26 INSTALL NAME TAPE, PLUG IN PIPE TAPPED HOLE AND STAMP
FINAL INSPECTION
PAINT DELIVER TO STORE ROOM
BALANCE DIM.
PART PRINT DIM.
STOCK REMOVED
KEY
FINISHED PART PRINT DIMENSION
LOCATING OR BANKING POINT
BALANCE DIMENSION
START FROM LOCATING POINT

Combined Drawing and Instruction Sheet

BY GEORGE CAVERN

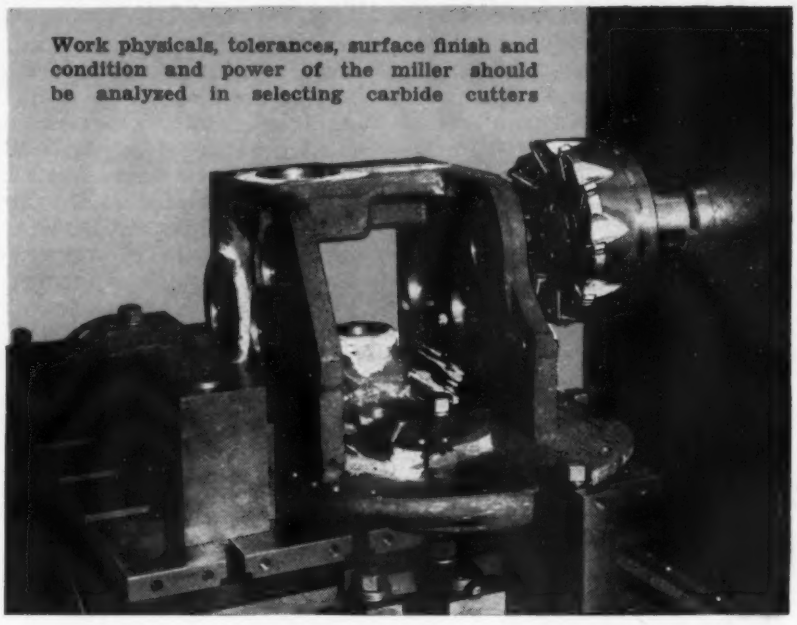
THIS combined drawing and instruction sheet was used in one smaller war plant making special airplane-engine components. It not only contains all necessary dimensions but also full details of the 26 operations necessary to complete the piece. They begin with bench inspections for flaws and dimensions for cleaning up in machining.

The third operation takes the piece to a Bullard vertical mill for rough and semi-finishing the face and boring the after end to 16.940 in., plus or minus 0.001 in. This end also shows that the 15th operation finishes the bore to 17.00 in.

Operation 4 is also on a Bullard, while No. 5 is a milling job and No. 6 a pressure test. Then come four drilling operations, full details being given following each operation number. This is followed by milling, lathe work, drillpress, and two more engine-lathe operations. After this, all operations are done on the bench.

Dimensions and tolerances are given where they can be easily seen, the key showing just what each symbol means. This sort of drawing combines the work of the drafting room and the planning department and is probably best suited for comparatively small shops.

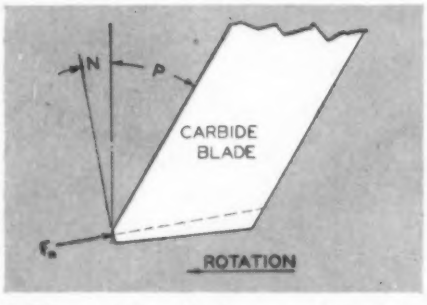
Steel may be removed efficiently with inserted blade face-milling cutters combining the strength of negative rakes with low power requirements of positive rakes



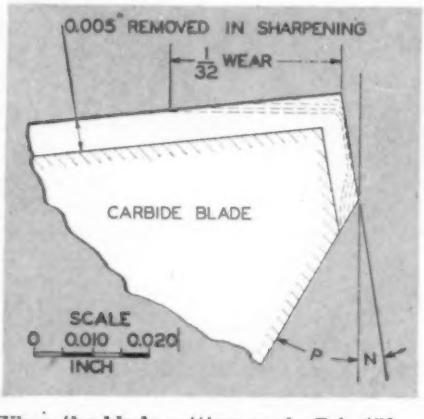
Work physicals, tolerances, surface finish and condition and power of the miller should be analyzed in selecting carbide cutters

How to Select CARBIDE MILLING CUTTERS

BY D. V. STEVENS AND A. O. SCHMIDT
KEARNEY & TRECKER CORPORATION



Solid carbide blades are located radially in the cutter body at a 15° positive secondary radial-rake angle *P*. Primary radial-rake angle *N* can be positive or negative, depending on cutting force *Fn*



When the blade setting angle *P* is 15°, outward radial movement is about three times its axial movement and less carbide is removed in sharpening

CARBIDE face-milling cutters, developed in an intensive metal-cutting research program, are giving high rates of metal removal, reducing power consumption and extending cutter life. These cutters have solid carbide blades, double radial-rake angles, radial blade location, wedges behind the blades and forged steel bodies.

With the double radial-rake angle construction, both ferrous and non-ferrous metals can be milled at high metal removal rates. While the blades are located in the cutter body at a positive secondary radial-rake angle, primary radial-rake angles may be varied from 0 to 10° positive for cast iron and non-ferrous metals and from 6 to 10° negative for steel.

In milling steel, the double radial-rake angle combines the strength of negative primary angle with overall efficiency and lower power consumption of the positive secondary-rake angle. Where blades are of equal thickness it provides more carbide in line with the normal cutting force than does the negative radial-rake angle design. Width of faces formed when grinding primary radial-rake angles should be from 0.020 to 0.025 in.

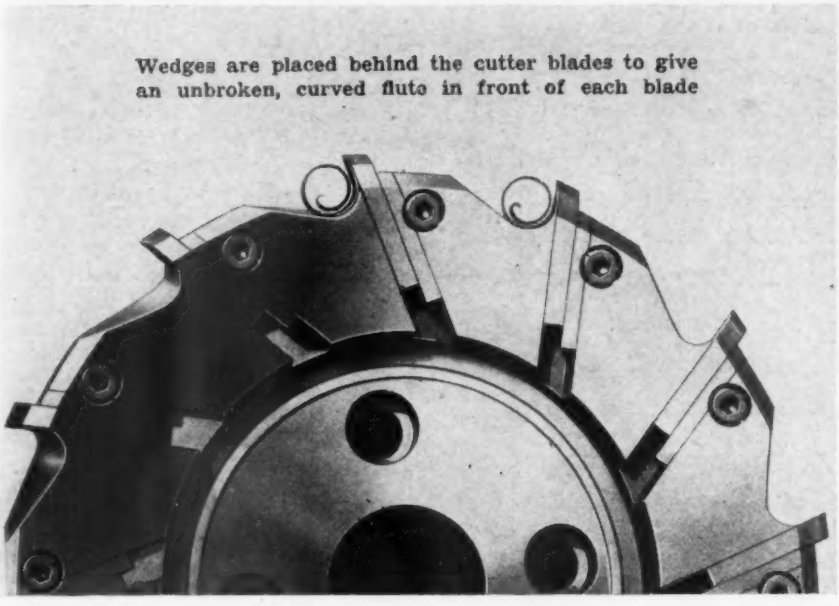
Rapid chip formation and expulsion afforded by wedge-backed blades are of particular importance in machining ductile materials, where continous chips are formed. Chip packing may be prevented by hard surfacing the flutes and removing corners and sharp edges around them.

Cutter tests show that wear at the peripheral-cutting edge is approximately three times as great as wear on the face-cutting edge. A blade set at a 15° angle advances in radial and axial direction in correct proportion to this wear ratio.

Although grade of carbide depends on the metal being milled, a crater-resistant type is recommended for general milling of steel and an abrasion-resistant type for cast iron, non-ferrous metals and non-metallics.

The number of blades required in a face-milling cutter for a given operation is influenced by three factors:

1. Power consumption when oper-



Wedges are placed behind the cutter blades to give an unbroken, curved flute in front of each blade

ating at an efficient feed per tooth.

2. Chip space necessary to accommodate chips removed during the operation.
3. Rigidity of work and setup.

Power consumption is probably the most important factor in cutter selection and depends largely on the rate of metal removal which, in turn, is determined by the feed rate.

Metals forming continuous chips, such as aluminum and steel, require more chip space than those forming broken chips, and call for cutters with greater chip space and fewer blades.

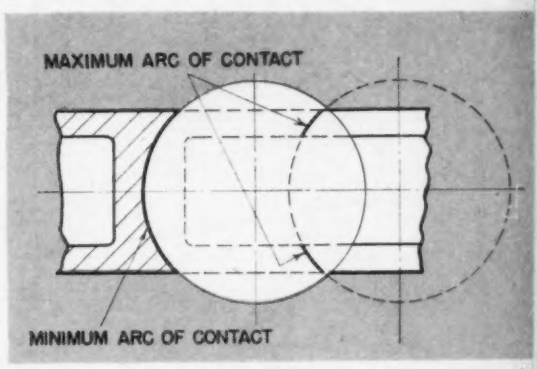
Interrupted surfaces require a milling cutter with maximum chip space while a cutter with slightly less chip space and more teeth is recommended for cored surfaces. Under all conditions, chips formed during the maximum arc of cutter-work contact should govern cutter selection for chip clearance.

Cutters with the number of blades equal to the diameter in inches are most suitable for milling steel with standard milling machines. Cutters with the number of blades equal to diameter in inches plus two, are suitable for milling steel with heavy-duty CSM milling machines, which have the added power and rigidity to operate efficiently at higher rates of metal removal. Cutters with the number of blades equal to twice the diameter in inches may be used for milling cast iron and non-ferrous metals or free-cutting steels where low power is required.

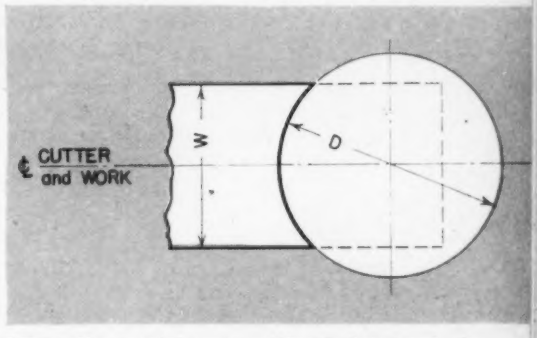
Feed per tooth is the movement of the work past the cutter for each tooth engagement. This value, which does not necessarily equal chip thickness, is computed from the formula:

$f = F/Nn$, where F is feed rate in in. per min., N the cutter speed in rpm. and n the number of cutting teeth.

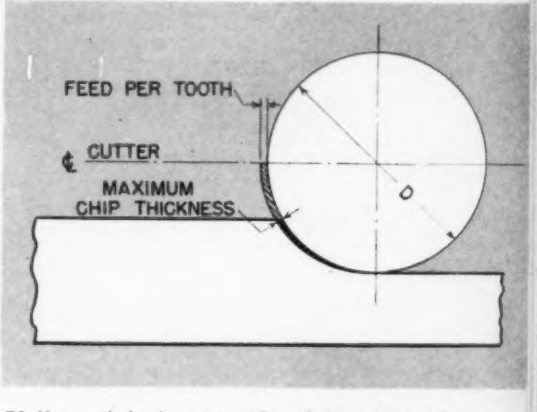
If the cut is symmetrical about its centerline and the axis of rotation of



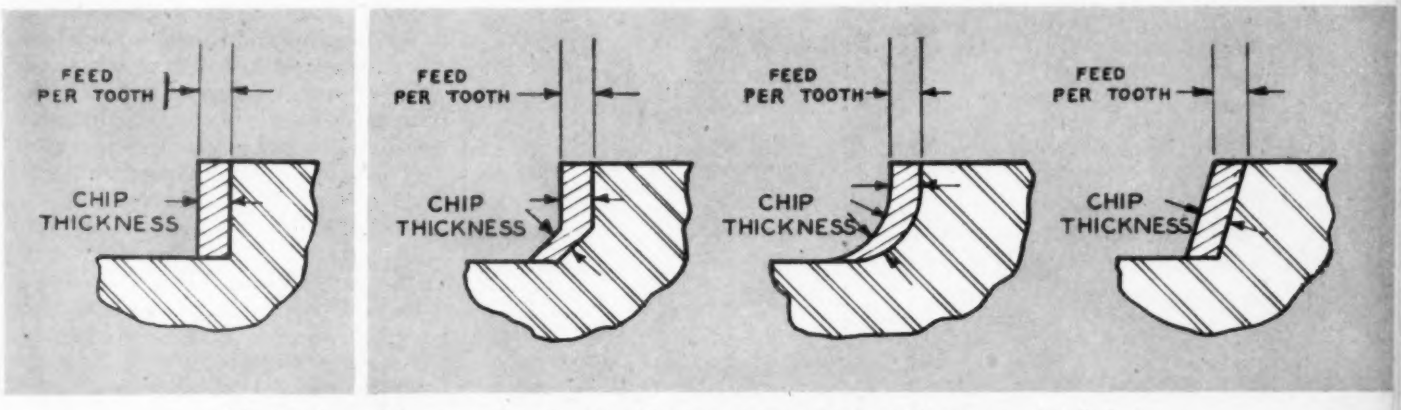
The chip formed during the maximum arc of cutter-work contact is a controlling factor in calculating required chip space



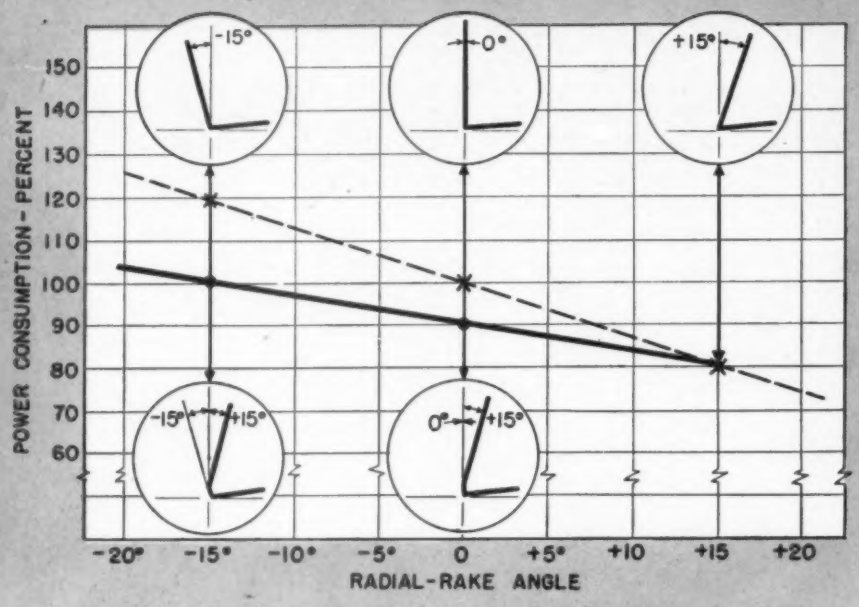
When the peripheral cutting edge angle is zero and the cut is symmetrical the feed per tooth equals the maximum thickness



If the cut is to one side of the axis of rotation, chip thickness varies with direction of the milling cutter rotation

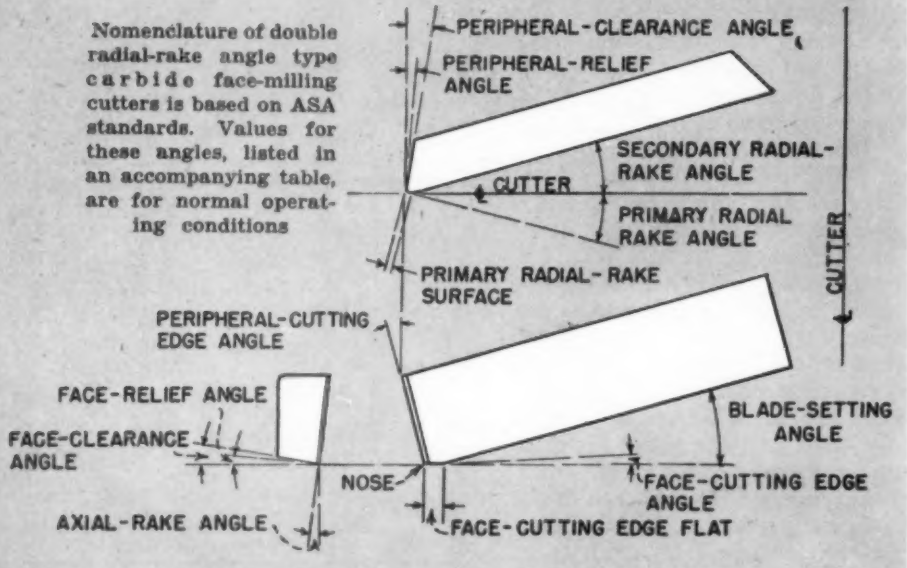


Where the cut is symmetrical, chip thickness equals feed per tooth, as at left, but where there is a chamfer or radius, chip thickness averages less than the feed per tooth



The broken line indicates power consumption of cutters with a single radial-rake angle and the solid line illustrates the lower power consumption of double radial-rake angle face-milling cutters. This data may be used in conjunction with the milling machine selector chart

Nomenclature of double radial-rake angle type carbide face-milling cutters is based on ASA standards. Values for these angles, listed in an accompanying table, are for normal operating conditions



FACE-MILLING SPEEDS AND FEEDS

MATERIAL TO BE MILLED	PRIMARY RADIAL-RAKE ANGLE	SURFACE SPEED (fpm)	FEED PER TOOTH
Aluminum	+10	Highest Possible	0.010-0.030
Brass—soft	+6	350-1000	0.010-0.030
Bronze	+3	200-800	0.005-0.015
Bronze—hard	0	125-350	0.003-0.010
Cast Iron—soft	+6	250-400	0.010-0.030
Cast Iron—hard	+3	200-300	0.005-0.015
Cast Iron—chilled	0	150-250	0.005-0.010
Malleable Iron	+6	300-400	0.010-0.030
Steel—soft	—6	350-750	0.010-0.020
Steel—medium	—8	250-400	0.007-0.015
Steel—hard	—10	150-300	0.003-0.010

CARBIDE MILLING CUTTERS *(continued)*

the cutter, and the peripheral cutting edge angle is zero with no chamfer angle, feed per tooth will equal maximum chip thickness.

Where the peripheral cutting edge angle is greater than zero, chip width is increased, chip thickness decreased and the feed per tooth is greater than chip thickness.

Where there is a chamfer or radius at the junction of the peripheral- and face-cutting edges, chip thickness will not always equal feed per tooth. If the centerline of the cut and the axis of cutter rotation do not coincide, feed per tooth may be the same, but chip thickness will vary from zero to maximum, or inversely, depending on direction of rotation. A knowledge of feed-to-chip thickness relationship for typical operations helps to provide proper operating conditions for carbide face-milling cutters.

Proper Entrance Angle

The angle between the cutting face and work at the point of entrance has a pronounced effect on cutter life. A ratio of from 5:3 to 3:2 between cutter diameter and width of work insures correct entrance angle. If a cutter of the proper diameter is not available, select a cutter of greater diameter and shift the work until the entering edge is off-center a distance equal to 3/5 to 2/3 the radius of the cutter.

Capacity, power, rigidity and condition of the milling machine are factors to be considered in getting maximum efficiency from carbide face-milling cutters. Capacity is determined by size of work and nature of operation. Since carbide cutters demand high efficiency of the machine, backlash in the table feed screw and spindle play should be at a minimum. All gibs and the driving clutch should be properly adjusted.

Milling machine requirements can be determined by calculating the volume of metal to be removed per minute and using the selector chart shown here, which was developed especially for machines manufactured by Kearney & Trecker Corporation.

Volume of metal removed is computed from the formula:

$$V=FWD$$

where F is the feed rate in in. per min., W the width of cut in in. and D the depth of cut in in.

Total power consumption is the power required at the cutter to separate the chips from the work and to

MILLING MACHINE SELECTOR BASED ON HORSEPOWER REQUIREMENTS

MATERIAL TO BE MILLED	RATED HORSEPOWER OF MACHINE																	
	H, K, AND BED TYPE SERIES												C.S.M. SERIES					
	3		5		7.5		10		15		20		20		30		50	
	MAXIMUM METAL REMOVAL (CUBIC IN. PER MIN.)																	
Aluminum	2.7	4.9	5.5	7.6	8.7	12	12	17	18	26	27	38	30	41	49	65	91	118
	6.0	7.1	11	14	16	21	23	28	35	44	49	60	52	63	81	100	145	173
Brass — Soft	2.4	4.2	4.7	6.6	7.5	10	10	15	16	23	24	33	26	36	42	57	79	103
	5.2	6.1	9.4	12	14	18	20	24	30	39	42	52	45	55	71	87	126	150
Bronze — Soft	1.7	3.0	3.3	4.7	5.3	7.3	7.3	11	11	16	17	23	19	25	30	40	56	72
	3.7	4.3	6.7	8.7	10	13	14	17	21	27	30	37	32	39	50	61	89	106
Bronze — Hard	.78	1.4	1.6	2.2	2.5	3.4	3.4	5.0	5.3	7.5	7.8	11	8.7	12	14	19	26	34
	1.7	2.0	3.1	4.0	4.7	5.9	6.5	8.1	10	13	14	17	15	18	23	29	42	50
Cast Iron — Soft	1.6	2.9	3.2	4.5	5.2	7.1	7.1	10	11	15	16	23	18	25	29	39	55	71
	3.6	4.2	6.5	8.4	9.7	12	14	17	21	26	29	36	31	38	49	60	87	103
Cast Iron — Hard	1.0	1.9	2.1	2.9	3.3	4.6	4.6	6.7	7.0	10	10	15	12	16	19	25	35	45
	2.3	2.7	4.2	5.4	6.2	7.9	8.7	11	13	17	19	23	20	24	31	38	56	66
Cast Iron — Chilled	.78	1.4	1.6	2.2	2.5	3.4	3.4	5.0	5.3	7.5	7.8	11	8.7	12	14	19	26	34
	1.7	2.0	3.1	4.0	4.7	5.9	6.5	8.1	10	13	14	17	13	18	23	29	42	50
Malleable Iron	1.0	1.9	2.1	3.0	3.4	4.7	4.7	6.8	7.3	10	11	15	12	16	19	25	36	46
	2.3	2.7	4.2	5.5	6.4	8.1	9.0	11	15	17	19	23	20	25	32	39	57	68
Steel — Soft	1.0	1.9	2.1	2.9	3.3	4.6	4.6	6.7	7.	10	10	15	12	16	19	25	35	45
	2.3	2.7	4.2	5.4	6.2	7.9	8.7	11	13	17	19	23	20	24	31	38	55	66
Steel — Medium	.78	1.4	1.6	2.2	2.5	5.4	3.4	5.0	5.3	7.5	7.8	11	8.7	12	14	19	26	34
	1.7	2.0	3.1	4.0	4.7	5.9	6.5	8.1	10	13	14	17	15	18	23	29	42	50
Steel — Hard	.56	1.0	1.1	1.6	1.8	2.5	2.5	3.6	3.9	3.4	5.7	8.4	6.3	8.6	10	13	19	25
	1.2	1.4	2.2	2.9	3.4	4.3	4.7	5.9	7.3	9.8	10	12	11	13	17	21	30	36

Rated capacity Continuous Operation — 7.1 10

50% Over rated capacity, intermittent Operation, 5 min. max. period. Minimum idle period between cuts should equal ½ cutting time. — 14 17

25% Over rated capacity Normal Operation

75% Over rated capacity intermittent operation. 1 min. max. period. Minimum idle period between cuts should equal the cutting time.

EXAMPLE: To select a milling machine having sufficient power to remove 7 cu. in. of soft cast iron per min. continuously: read down material column to cast iron-soft; read right to first number equaling or exceeding 7; read up to horsepower rating. To remove soft cast iron at the rate of 7 cu. in. per min. a 10-horsepower machine should be used.

Copyright by Kearney & Trecker Corp.

drive the spindle and feed mechanisms at a selected rate. This includes motor, coolant pump and transmission losses and friction losses in gears and bearings. As a result, capacity is restricted to the rated horsepower of the machine.

Where maximum power is not required continuously, motor and machine can be operated in excess of rated capacity. Provisions made in the selector chart specify rate of metal removal under various operating conditions, making it safe to operate machines at high loads intermittently.

Power consumption per cu. in. of metal removed per min. tends to decrease with increased feed per tooth, and the area of separation with the coarser feed is less. This is important where the machine is operated considerably in excess of rated capacity and an increase in feed per tooth may bring about some power reduction, the rate of metal removal remaining constant.

Power recommendations in the selector chart are based on the use of a reasonably sharp cutter with a zero radial-rake angle. Power required to remove a given amount of metal decreases as the radial-rake angle becomes positive and increases as it becomes negative. If the power value with a zero radial-rake angle is considered as 100% the approximate power consumption for a cutter with a different angle is calculated by assuming a 1% decrease in power for each degree of change in a positive direction and 1% increase in power for each degree of negative change.

However, the described double radial-rake angle cutter with a zero primary radial-rake angle and 15° positive secondary radial-rake angle requires about 90% of the power consumed with conventional cutters. With the secondary radial-rake angle fixed at 15° power consumption will be reduced 0.5% for each degree in a positive direction and increased 0.5% for each degree of negative change. This applies where maximum chip thickness is at least one-half the width of the primary radial-rake angle at the peripheral cutting edge.

A cutter should be reground when about 1/32 in. of wear is evident on the peripheral relief angle. Operation of the cutter beyond this stage reduces efficiency, gives poorer surface finishes and increases the amount of carbide removed during subsequent grinding.

Premature cutter failure may be due to:

1. Fracture or chipping at the peripheral cutting edge, due to excessive feed, insufficient surface speed and an extremely hard grade of carbide.

2. Excessive abrasion on the pe-

DOUBLE RADIAL-RAKE CUTTER ANGLES

MATERIAL TO BE MILLED	Radial Rake-Angle Primary	Rake-Angle Secondary	Axial-Rake Angle	Blade-Setting Angle	Peripheral-Cutting Edge Angle	Peripheral-Relief Angle	Peripheral-Clearance Angle	Face-Cutting Edge Angle	Face-Relief Angle	Face-Clearance Angle
Aluminum	+10	+15	—7	15	15	9	11	0 to 1	5	7
Brass—soft	+6	+15	—7	15	15	9	11	0 to 1	5	7
Bronze	+3	+15	—7	15	15	6	8	0 to 1	5	7
Bronze—hard	0	+15	—7	15	15	4	6	0 to 1	3	5
Cast Iron—soft	+6	+15	—7	15	15	4	6	0 to 1	3	5
Cast Iron—hard	+3	+15	—7	15	15	4	6	0 to 1	3	5
Cast Iron—chilled	0	+15	—7	15	15	4	6	0 to 1	3	5
Malleable Iron	+6	+15	—7	15	15	4	6	0 to 1	3	5
Steel—soft	—6	+15	—7	15	15	4	6	0 to 1	3	5
Steel—medium	—8	+15	—7	15	15	4	6	0 to 1	3	5
Steel—hard	—10	+15	—7	15	15	4	6	0 to 1	3	5

CARBIDE MILLING CUTTERS (continued)

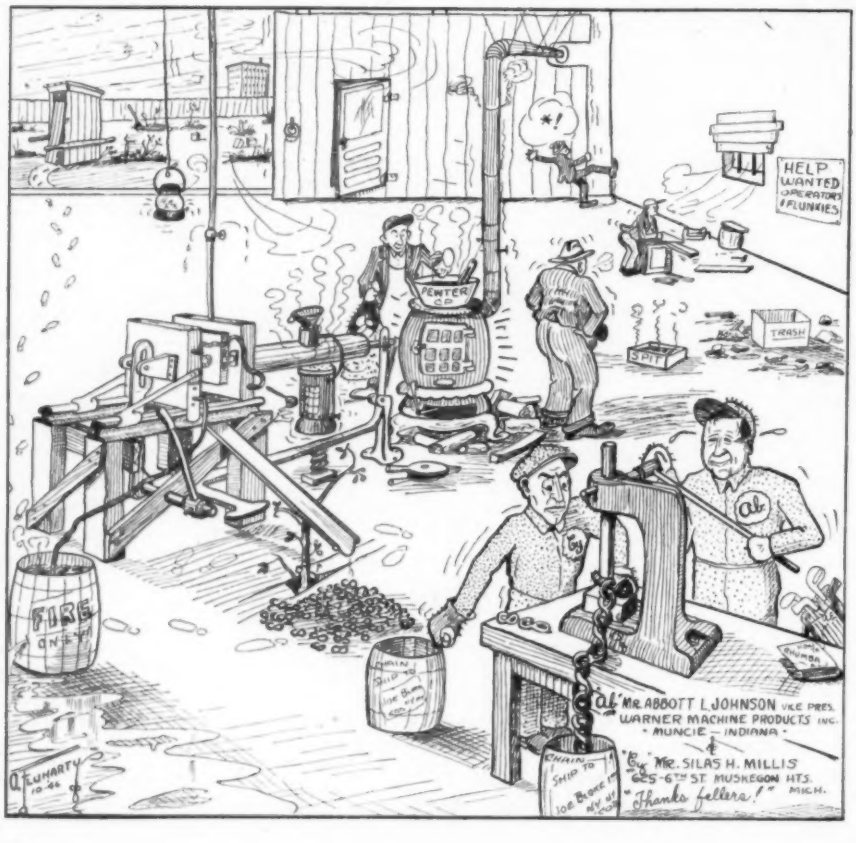
ripheral or face relief angle. This type of failure may be remedied by increasing feed, reducing surface speed or using a more abrasion-resistant grade of carbide.

3. Excessive cratering, identified by formation of a depression directly behind the peripheral cutting edge. Surface speed should be reduced and a crater-resistant carbide substituted.

When these various types of abnormal wear are properly balanced, long tool life and economical carbide use can be expected. Many of the probable sources of cutter failure can be checked or eliminated by recognizing the numerous factors involved in a successful operation of cutter and machine. The feed rates, surface speeds, grade of carbide, number of blades in a cutter, work analysis and construction, method of clamping, and condition of the machine are among the factors to be investigated in setting up an operation.

Ed. Note—J. P. Bunce and J. R. Roubik of the Kearney & Trecker Corporation collaborated with the authors in collecting and checking the data presented in this article.

OUR SHOP . . . 12 ——— *Precision Die-casting Dept.*


HELP WANTED OPERATORS & FLUNKIES
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MR. ABBOTT L. JOHNSON VICE PRES. WARNER MACHINE PRODUCTS INC. MUNCIE — INDIANA
MR. SILAS H. MILLIS 655-6TH ST. MUSKEGON HTS. MICH.
"Thanks fellers!"

TIPS for Top Shop Men

129 Safety factors are provided to cover hidden structural weaknesses, not human ones. Don't let workmen overlook tools or handling equipment because they're sure the equipment can "take it." A breakdown may tie up a job for days or even cost a life.

130 Keep an eye out for "pet" tools that are saved beyond their safe working lives. No matter how good an edge a chisel has, a burred head will still throw bits of jagged metal or gouge a hand. A split hammer handle can't take it either, nor can a hacksaw frame held together with baling wire. Don't let these pets bite their masters.

131 Study trimmings or stubs before you scrap them. Can you or some other department use this "scrap" instead of new material for some parts? Can parts be nested to reduce waste in cutting blanks from sheet stock?

ROUND TABLE

Do 'Rolling Stones' Gather Polish?

"Al, that John Tobias workin' for you is a swell mechanic. Where'd you get him? He's not from around here anywhere, is he?"

"No, Ed, he's not. He just came by a couple of weeks ago, and Personnel sent him in to me. He said he was a good all-around machinist, and he is. All he's got is a few worn tools, but he can do anything I set him at with those."

"That boy's a toolmaker, Al, if I've ever seen one. He tackles a job like he knows what it's all about. He must've put in years in some swell shop."

"Don't get ideas about swiping him, you old pirate. I need him and you've got plenty of good men. What's more, he's never worked anywhere more than a year or two, except when he had to during the war. He didn't even serve out his time. He's a rolling stone, Ed."

"Well, I'll be darned. He looks like a good man, too."

"He is a good man. Don't pull that old gag about 'A rolling stone gathers no moss.' If 'moss' is supposed to mean know-how, John has plenty for my dough!"

"Don't let him pull the wool over your eyes, Al. He looks good—even had me fooled—but guys like that always have a weak spot, or they wouldn't be moving on so often."

"That idea is all hooey, Ed. John has plenty on the ball. He may just have what they call a restless foot. He isn't shiftless—he works hard and steady, and he does every job right. I asked him the other noon how come he'd drifted around so much. He said he didn't know, just figured he'd like to see the country or something. So when he gets a stake together, he moves on. He says the job just begins to bore him stiff, so he goes to another one where everything is new. He's worked all over the country, and outside some, too."

"Yeah, and always for peanuts, I'll bet. If he'd only grow up and settle down, he could get himself a good job."

"He's had some good jobs, Ed, has been a foreman several times. He just gets fed up. And don't think he works for peanuts. I started him fairly low, but I've already boosted him to top rate. I want to keep him as long as I can."

"He's certainly fed you a line! Paying top wages to a no-account drifter. Just when you need him, he'll pull out. Meantime, he'll keep up his soft-soapin' and fast-talkin' as long as he figures he's gettin' away with it."

"No, Ed, he isn't that kind of guy. He works until the job gets tiresome. If I can keep him happy and throw tricky jobs at him, he'll be interested and will stay. And don't change your mind about his ability. He may not have moss, but like the wiseacre says, he certainly has picked up plenty of polish. And he's raked in more shekels than a lot of the boys who stay put."

"I still think he ought to grow up and settle down and until he does, havin' him around is just headin' for trouble."

***WHO IS RIGHT**, Ed or Al? Is the "rolling stone" incompetent and undependable, or is he worth handling with kid gloves to hold him as long as possible? How have rolling stones you knew compared to the stick-in-the-mud pluggers? Other readers will be interested in your experiences and opinions. Discussions of previous topics appear on later pages.*

Machine Tools of Tomorrow—4

DESIGN REQUIREMENTS

BY GOSTA R. TRUEDSSON
CONSULTING ENGINEER AND PHYSICIST

Hydraulic hold-downs, improved table lubrication and growing use of plastic parts foreseen in this concluding installment

MACHINE TOOLS will certainly not be powered by the energy within the atom for a great many years. However, development of the atomic bomb has been of indirect benefit by dispelling general disbelief in the importance of scientific research. The recent influx of men particularly fitted by education, aptitude and training to specialize in machine-tool design indicates that practical applied research can be put on a better than "just paying" basis. Immediate returns from their scientific efforts are numerous and important, and manufacturing processes and equipment previously considered the ultimate have become obsolete.

It is now evident to many manufacturers that the machine-tool industry can no longer afford to depend on the course of natural development by empirical methods. Substitution of a systematic program of scientific research is a necessity.

Although the function of research in the machine-tool industry has been confined mostly to furnishing engineering data on which machine designs may be based, or solving those problems arising in conventional manufacture, progress has been accelerated by some application of basic scientific research. Investigations into the basic process of metal cutting led to modern high-speed milling. Manufacturers were quick to capitalize on this development and apply it to other metal-cutting processes, greatly increasing the efficiency of our present production machines. Machine-tool users then began to demand more rugged machines, capable of withstanding the added stresses imposed upon them.

Similarly, efforts of research workers to improve the load-carrying capacity of bearing surfaces focused attention on the importance of the infinitesimal dimensions of the boundary layers of finished surfaces. This prompted further basic research into the metal-finishing process and the outcome was the now familiar method of "Super-finishing."

Other processes such as "super high-speed cutting," "liquid honing" and "shot peening," have added to our knowledge of fundamental factors entering into the process of machining metals, even if those processes have not yet found wide application in the shop.

One of the more recent machine-tool design considerations added by the increased importance of precision and interchangeability, and the complications added by increasing rates of removal, is the necessity of finding a new method of hold-down for machine-tool slides and tables.

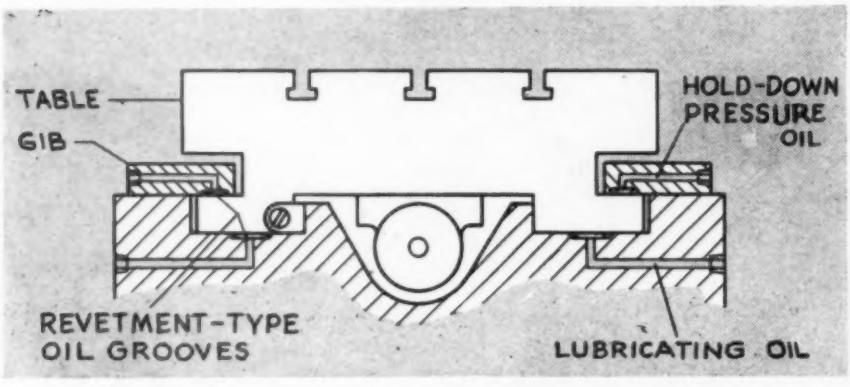
A hydraulic hold-down that may be adapted to horizontal as well as vertical slides is shown. Horizontal tables held down by gravity may not have the stability required under heavy cuts, or the smooth motion necessary to obtain close dimensional control or fine surface finish. Vertical slides may require similar application of hydraulics for hold-in purposes to assure a uniform pressure on the ways at all points and to neutralize the moment tending to displace the slide from the vertical.

Seek Better Lubrication

Such preloading of tables and slides, if properly designed, may also offer the further advantage of greatly improving present means of lubrication. A lubrication system is shown here that may eliminate the complaint of "sticky" tables caused by metal-to-metal contact between the sliding members through local breakdown of lubricating oil film. It should be possible, in this way, to obtain a table that would be floating on oil, as the system has self-controlling properties tending to keep the leakage gap constant and centralizing the sliding member between the ways and gibs.

In striving for higher spindle speeds, with ever-increasing rates of acceleration and deceleration to shorten the operating cycle, many rotating members on our present machine tools will soon be outmoded. To reduce the inertia of rotating bodies or machine-tool elements, applications will soon be found for plastics in such components as sheaves and rotating cylinders for clamping or feed devices.

Future high-speed applications may also demand radical changes in de-



Preloading the machine-tool table by hydraulic hold-downs may be a means of maintaining stability and rigidity under heavy cuts

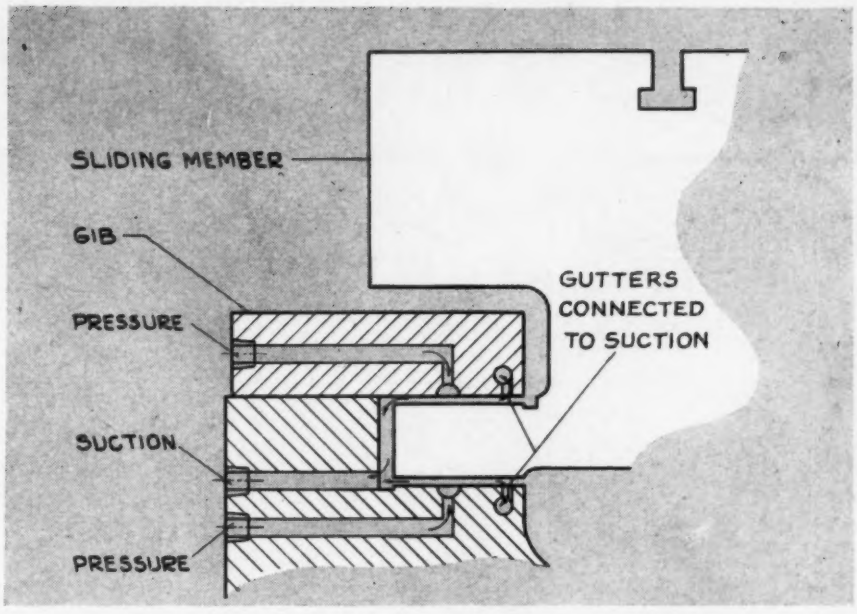
sign of electric motors. A change to silicone insulation, permitting motors to operate at higher temperatures and allowing designers to reduce the size of the rotor, may be required on frequent-cycle jobs where the inertia load offered by the motor may be the greatest factor in acceleration load.

Plastics will also be applied to machine-tool elements which formerly required such time-consuming operations as boring, milling, grooving, drilling and polishing, but on which no great demands for strength or precision were made.

Laminated plastics, whose inherent properties indicate convenient and economical fabrication, are already being considered by many manufacturers as possible materials for guards and shields where weight is important. A touch of color and beauty, where it will enhance the appeal of the product, may thus be added at no extra cost. The designer's problem is only to understand the characteristics and limitations of the material selected. It must first be tested against the functional requirements of its new application before being presented as a substitute for other materials.

Restricted supply of various materials during the war period resulted in many substitutions, which frequently proved to be superior in many respects. Manufacturers were astonished to find how well they could do withhout many of the old things and how much they were learning about the new substitute or synthetic material. Attention became focused on science, as the important developments made through scientific research were accepted and became familiar objects in our daily life.

As science is digging ever deeper into the structure of matter, the products of research are destined to affect greatly the economic conditions under which the world must live. As new things are produced and come into use, new horizons will appear. And, as one of the basic elements by which practically all forms of expenditure must pass before new products can be born, machine tools will be subjected to new demands, which in turn will open up new vistas for research.



By keeping the leakage gap constant and centralizing the sliding member between the ways and gibs automatically, it should be possible to keep the machine-tool table floating on oil, eliminating chatter and ironing out the lubricating film

Watch Workers' Clothing If Operations Must Be Dust-free

In air-conditioning areas for precision machining, inspection and cleaning, trouble is frequently experienced with lint from clothing of workers, and to a lesser extent from polishing cloths. As a consequence, such companies as Eastman Kodak and New Departure require employees working in critical areas to wear dust-free uniforms, and pass them through dedusting cabinets (miniature wind tunnels) and over electric shoe cleaners on their way in. Effectiveness of such measures has been proved by the increase in air-borne lint during periods when uniforms and dedusting equipment are not in use.

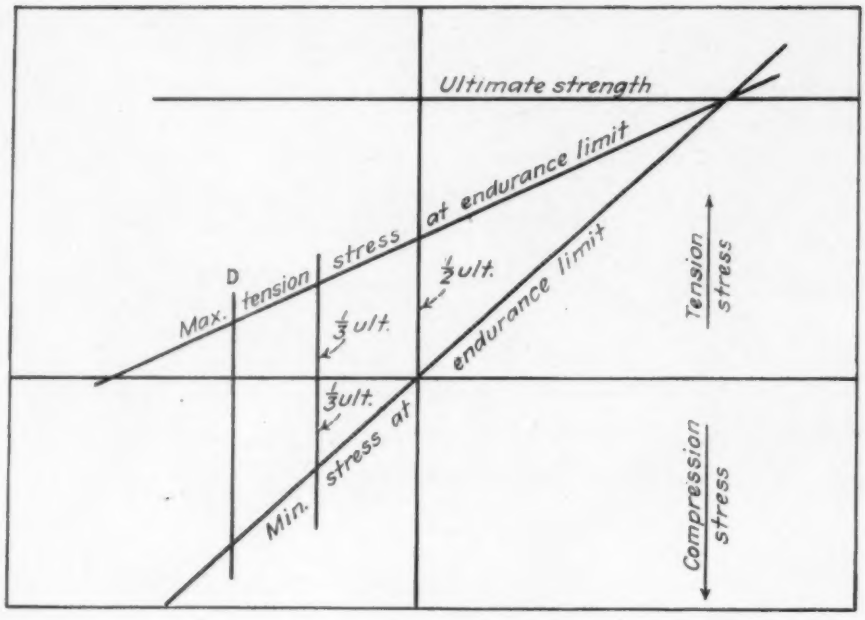
The deducter developed during the war is reminiscent of the blowers that lift girl's skirts at amusement parks. These do the same thing (by blast through a grille over which they walk) but for far less exciting reason. Further, the blown air is warmed and filtered dust-free. Bits of line and dust are blown upward from clothes into an overhead exhaust stack.

Shoe cleaners take the form both of brushes and of a sticky pad, the latter to remove dust and dirt clinging to shoe soles.

Humidification reduces flying dust to a considerable extent, as does oil treatment of floors. One source of dust, where women are employed, is the use of face powder, which not only enters the atmosphere from the face and body, but from the clothing as well (where it has clung either from contact or from normal flying about during application.

Rayon is apparently the most dust-free fabric, but does not stand commercial laundering very well. As a consequence, preferable lint-free fabrics are half spun rayon, half cotton, Sanforized and vat-dyed. Cotton or cambric dresses or wrap-around coats have also been used.

Sperry (in its electronics laboratory) and many other companies used smocks, headgear and gloves of such materials, laundered carefully to specifications of the weaver and of the American Institute of Laundering. This in general involves use of soft water to prevent precipitation of calcium or magnesium soaps on the fabric and possible powdering and dusting of the latter. Hard water also causes loss of whiteness.



Mr. Straub proposes modification of the statement that all fatigue failures are a result of tension stresses, showing actual failure may be caused by compression

Can Compression Stress Cause Fatigue Failure?

BY JOHN C. STRAUB

CHIEF RESEARCH ENGINEER, AMERICAN FOUNDRY EQUIPMENT COMPANY

WITH THE ADVENT of commercial shot peening, many considerations have arisen concerning the reasons for the increase in fatigue life resulting from this process. One question which has caused considerable controversy arises from the statement by J. O. Almen* that all fatigue failures are a result of tension stress, not a result of compression stress.

My purpose here is to provoke thought on a theory with respect to fatigue failures which might appear to be the result of compression stresses. In order to avoid complications with respect to shear stresses or complicated stress patterns, such as contact stresses, etc., let us limit this discussion to stresses in simple bending.

The theory proposed involves reference to the Goodman diagram, (above). According to this diagram, endurance limit is influenced by the range of stress in that the greater the change of stress during a cycle the lower must be the maximum stress in tension, if the part in question is to have indefinite fatigue life. In other words, under the condition of very slight change of stress, the maximum stress allowable for indefinite life approaches the ultimate strength of the material. With a stress change of half the ultimate strength, of the maximum tension stress for indefinite life must be reduced to approximately half the ultimate strength.

If the stress range is increased to the condition of complete reversal of stress, the maximum tension stress for indefinite life is only one-third the ultimate strength, because at that point the magnitude of stress change is represented by two-thirds of the ultimate. At that point, tension stress is usually considered the cause of fatigue failure, even though the compressive stress is of the same magnitude as the tension stress in the same stress cycle.

Compression Effects

But let us suppose we carry the Goodman diagram still further to the left, to position *D*. At this point the specimen is subjected to a relatively small tension stress and a large compression stress. Inasmuch as what might be termed the maximum stress is compression, we now attribute the fatigue failure to compression stress. But is it not logical to expect that the Goodman diagram (or a modification of it) is a continuous function and that the stress responsible for the fatigue failure is the maximum stress *in the direction of the scale of tension stress?* It appears that this concept would be more logical than that of assuming a reversal of conditions at some arbitrary point. One might ask: "At what stress range, considering the magnitude of tension and compression stress, does the compression-stress side of the range become responsible for the fatigue failure?"

This theory does not necessarily assume validity of the exact shape of the Goodman diagram as originally proposed. That is, if we were to consider modifications of the diagram which have been suggested by subsequent fatigue testing, the picture would still be the same as far as the relative effects of maximum stress *in the direction of tension* are concerned. It is quite possible that such a theory would hold if the stress in the direction of tension were zero, or even negative.

*"*Improving Fatigue Strength of Machine Parts*" The Iron Age, *June 10, 1943.*

TALKING SHOP

Eat It or Wear It

WE'VE HAD a number of interesting soybean meals around Detroit and Windsor during the meat shortage. Now, out at Ford Motor the soybean is going places. Specifically it will be the basis of more than 20,000 gal. of body enamel which is to be manufactured daily at the plant when peak production is reached. The modified soybean oil is cooked, thinned, filtered, color added and ground in water-cooled ball mills. When this enamel goes onto a Ford, try and get it off. It's there to stay —another example of the permanency of synthetic resins.

Who Finishes 'Em?

THE LIVES of technical editors trying to help Government officials publish war production know-how were fairly trying. One editor, now happily returned, tells us his former boss was turning the spotlight on the steel industry. Our technical editor had just finished providing the figures on U. S. ingot production. Said the boss: "Now, how about giving me the latest figures on *finished*-ingot production." What's a finished ingot — a railroad car, a range or a tin can?

Packaging: Giant Size

RECENTLY we watched a machine tool being packaged for long-term storage. Three coats of vinyl copolymer plastic solution were sprayed over the tool, sealing it from any danger of corrosion. The coat can be stripped off in less than two minutes and the machine, which was supplied with operating lubricants, is ready to run without cleaning. Each coat is a different color, so rough examination will tell how heavy the cover is. One of the biggest packaging jobs ever attempted will be 1400 B-29's. That we would like to see.

Want Anything Pumped?

WE WERE in a shop the other day just as the foreman was checking over pump needs with a sales engineer. The engineer showed a number of new models, claiming increased efficiency rates. The foreman claimed that in specifying small pumps he never worried about rated efficiency. Where large pumps are concerned, such as some of those used at the Niagara Falls power stations, a difference of 0.25% affected annual cost by about $100,000. In small pumps, considerable progress is being made in compactness, accessibility and a minimum of perishable components.

The pump engineer left us with an interesting observation that one big food-canning company is no longer dipping its vegetable soup but taking it through a positive pump—and maintaining the correct concentration of diced vegetables at the output and loading stations. Sliced peaches are also being handled this way—with no bruises. As far as cost goes, never dip if you can pump.

No Cachoo

E. B. GALLAHER of the Clover Mfg. Co., Norwalk, Conn.—cachoo!—recently mailed his letter No. 7, which takes up "Absenteeism Due to Colds —An Item Which Enters into the Cost of Production." Mr. Gallaher, a 30-year sufferer from hay fever and a Roman holiday for germs of the respiratory tract, has not had any cold or hay fever for 18 months. He's been using an up-to-now commercially unavailable spray called "Pyogen." He's also furnished it to employees, and has had no absenteeism for the past year from colds. Even sinus sufferers claim they've been helped. Write him for his letter before you feel a code cubbing awd.

BEN CORRADO, fictionary editor, is surpassing himself. Here's the latest batch of additions to his zany digest:

PLANT SUPT.—Hot-house boss.

TUBE FITTING—Trying on a new hat.

V-BELT—One that successfully holds up the pants (V for victory).

KNEE-TYPE MILLER—Mill hand who always wants cuties to use his lap.

HORIZONTAL SHAPER — Generally refers to a bathing beauty in a horizontal position.

TAPPING MACHINE — Brewery contraption that bores holes in kegs.

OIL EXTRACTOR—Lie detector.

TOOL CRIB—Nursery for small tools.

ADJUSTABLE CHUCK — Baseball pitcher's throw.

GRINDING FIXTURE—Dental plate.

INCLINABLE PRESS — Russian newspapers.

ANGLE BLOCK — Football defensive play, executed by the tackles.

SALT BATH—A day at the beach.

ROLL NECK BEARING—A guy with a double chin.

STRADDLE MILLING—Wrestling bout.

CHUCK JAWS—Upset stomach.

STATISTICAL QUALITY CONTROL—Checking on the type of statistics supplied by the Research Department.

Even When Wrong

J. GORDON LIPPINCOTT & Co., New York industrial designers, found a "canister" vacuum cleaner could be pulled or pushed over carpets and floor just as easily without runners. But when the manufacturer sampled housewives, he found that 90% *thought* the cleaner pulled easier with runners. It *looked* as if it should. The runners, unnecessary from either a functional or an artistic point of view, and adding somewhat to production costs, have been added. The customer is always right, even when wrong.

SAFETY... from the inside out

BY JOHN WRAGE

SAFETY DIRECTOR, GISHOLT MACHINE COMPANY

Huge posters scattered around a plant don't guarantee safety. Psychology, humanity and good shop practice work out better

"Don't appear to know everything."...This simple, perhaps strange advice, came to me from "Shorty" Wilkinson the day I started out to take charge of safety in the plant where I had worked as a tool grinder.

"Shorty" was the Employers Mutual safety engineer who set up the basic program for making Gisholt a safer place to work. He has a philosophy for handling this kind of a job that has helped me over many rough places.

Here's what "Shorty" meant by not knowing everything: He knew that I had been a school teacher and school teachers often are afraid that not to know all the answers right off the bat is to lose the respect of their pupils.

"When they come to you with a safety question or a problem, tell them you don't know . . . but you'll find out. Then ask the foreman and let him tell you how it should be done, if he can. Or go back with the information after you have dug it up."

But, don't get the idea that the experience of long hours in the toolroom and in the psychology classroom is wasted on a safety director's job. A superficial glance at our plant and our safety records might be disappointing to some one who expected to find SAFETY blazoned all over the place. We don't do that here. Our safety committees are small; sometimes they don't meet very often. We use some safety posters on our bulletin boards from time to time, but we don't do anything to give our people the idea that safety is something extra . . . like rubbers on a rainy day. When you do this our theory is that, too often, like the rubbers, you won't have them with you when it rains.

So we approach this matter of safety from the inside out. We make the safe handling of tools and equipment as much a part of the job of running a machine as proper setup, careful adjustment and efficient operation. It is, too.

About a year and a half ago, with many of our former workers returning to the job from military service, we started a brief induction period for these men. This was not a course on how to handle a chisel or details like that. That is the foreman's job, his responsibility. What we set out to do in these courses was to sell the honesty and integrity of the company, its sincere, human interest in the workers' safety and their well-being, telling about the type of foremen for whom they were going to work, what would be expected of them and what they could expect from the foremen in help and cooperation.

We told them that in many ways times had changed since they had been here before; that many new safety precautions were now being taken . . . for their welfare. We imbued them with the idea that when their foreman asked them to wear goggles or safety shoes, he was not strutting his stuff or showing his authority, but merely trying to help them keep their limbs and eyesight for THEM.

First impressions are the most lasting and we spare no time and trouble to sell the foreman to the new workers. Personal contact with foremen, personal con-

The safety man should be concerned about the employee's safety off the job as well as in the plant

tact with workmen, all carefully worked out on a regular schedule to make sure that no one is overlooked, is the essence of the safety program at Gisholt.

Every one of the 137 foremen here spend ten minutes every day on safety. On Monday it is devoted to the inspection of two machines, and the foreman fills out a blank on which the machines are indicated by name and includes his report on them. I recheck this on my visits through the plant so the foreman knows that if he just marks "OK" on his blank and hands it back to me, he stands a good chance of being caught off base.

Every other day of the week the foreman talks with two workmen under his supervision on safety, devoting approximately five minutes to each. The subjects of these discussions, always informal, are supplied by management. Many valuable booklets are supplied to us by Employers Mutual as a basis for these foreman-worker talks. All these employee contacts are not merely on plant safety. We gave out a bulletin not long ago on safe bicycle riding which gave the foreman a chance to show that he and the company are not only interested in the employee's personal safety in the plant, but also in the welfare of his family.

Personally, I try to see every one of our foremen on the job at least four times a week. Sometimes it is only three, often it is for just a brief interchange of pleasantries. But I am there and make it easy for them to register any comments that they may have in mind. These are kept on my record just as I expect the foremen to give me records of their contacts.

How much time should a safety man spend in the plant, how much in his office? I don't know. I have

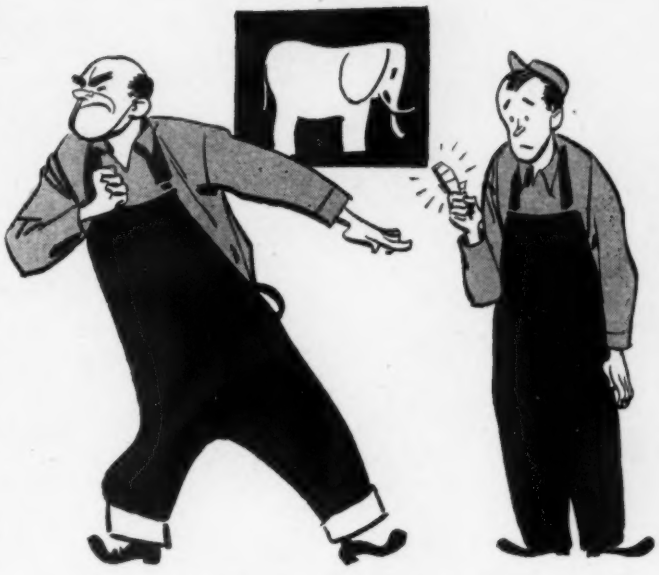
No time should be lost in selling the foreman to new employees, for whose safety he will be responsible and whose cooperation he needs

asked the question of many plant safety men at safety gatherings. Most of us seem to feel that at least 80% of the time in the plant is time well spent, and that is what I try to do.

In these walks through the plant many men come to me with complaints that this or that is not safe. "Have you seen your foreman about it?" is always my question. If he has not, I tell him to do so. If the foreman cannot arrange the matter satisfactorily, then I give what help is required. I see something being done wrong from a safety standpoint. Unless it is an emergency, where a man is likely to be badly hurt any instant, I look for the foreman. He takes care of it. The safety of his men is just as important to his record as a foreman as is their ability to turn out the right kind of work.

Our badge of lack of care is the well-known "White Elephant," an unwanted pachyderm which passes to the department where the last accident occurred. Mounted on a black background, this white elephant hangs in the offending department for one month, or until some other department has a disabling injury and "wins" it from them.

After reminding the department workers for a month of their sins of carelessness, it returns to my office and stays there until First Aid tips me off that another department has had an accident. If no accidents occur



The "White Elephant," an unwanted badge of carelessness, always shows up in the department with the most recent accident

for a month, the white elephant is placed in the office of Stanley Johnson, our vice president, and two months without an accident moves it into the President's office where George Johnson can point with pride to a safe plant.

Our most recent relief from accidents was six weeks, ending the middle of July. The elephant had been back in my office for two weeks when one of the boys got something in his eye. The eye watered a little. It didn't feel too bad. He could still see. Anyhow he passed up first aid until it began to hurt pretty badly the next day. Then the doctor sent him home for two days and . . . presto, he and the boys in his department on the day side had "Old Whitey" for a companion.

Which brings up another matter . . . First Aid. Every safety man knows that if first aid really comes first, it cuts down disabling injuries to beat heck. But it's so easy on the kind of a thing that happened to the man above to "think" it's all right and not go. This doesn't happen very often with us because we have the kind of a first aid department the men like.

In the first place, our first aid department is conveniently located in our largest plant. It is presided over by attractive nurses who know how to make and keep the kind of a place in which men feel comfortable. Agnes Moroney, R. N., who has been in charge all during our war growing pains when Gisholt jumped from 600 to 3400 employees, is much more than a nurse to these men. She and her five assistants have been helpful more than once on personal and family problems, and their tactful handling of them has made life more worth living for many Gisholt families.

"When I came here," Miss Moroney told me, "I found 32 cases of infection in the plant. Now, if I have one a year I feel terrible about it." Miss Moroney, thoroughly competent in handling the problems of her department, still enjoys her association with Helen Reischel, R. N., of the Employers Mutual industrial nursing staff, who brings her frequent and refreshing contact on her experience in many plant nursing problems.

This matter of our insurance engineering service is a very important one to me, as it is to most plant safety men. It is like having at our beck and call the best

First aid departments should be easy to reach, clean and attractive to the employees

brains and experience in the safety field. What is the best and safest material to use in our degreasing tanks? We have a twin arbor saw that's hard to guard. What shall we do about it? Ed Slavik, Employers Mutual Madison engineer, will be on the job any time we call.

Rules, someone has said, are made to be broken. There's a lot of truth in that, we believe. I don't tell the men they have to wear goggles on their jobs. Take a chap I talked with just the other day. I found him without goggles on a job where they should have been worn. I didn't cite any rule to him. I knew he had just had a new baby boy of which he was very proud. I stopped at his machine and while I was visiting with him I told him that I couldn't help feeling a little sorry for the new boy. "What do you mean?" he almost bristled. "It's about his poor blind father that I am thinking," I said. "When he grows up, he's likely to be leading the old man around and telling him where he is and what's going on." He got the point. I see him with his goggles on when I go out in the plant now.

Then there was the chap who insisted on working with long sleeves on a gear grinder. In placing the blank in the arbor he had to rest his elbow on the machine to adjust the center . . . a job no man should do with sleeves below the elbow.

First excuse he made for not rolling up his sleeves was that the sharp edge cut his elbow when he rested his arm unless he had the sleeve. We put a rubber pad over the arm rest. Still he worked with his sleeves down. Then he told us that his arm got too dirty. I told him that it was easier for him to wash his arm than for his wife to do the shirts . . . "and I'm going to tell her so," I told him. He grinned.

Not long after this, I met him with his wife in a neighborhood store one evening and I asked her if she didn't get tired slaving over those dirty shirts. Yes, she did, and she wondered how they got so dirty around the elbow. I told her, and she said she had been worrying about it, too. I suggested that we would cut the sleeves off at the elbow and she said she'd help.

Then, goaded to his limit, the chap rolled up his sleeves and showed arms which he had decided were skinnier than other men's arms. "Can you imagine me showing arms like this to the whole shop?" he stormed. I rolled up mine and they were a pretty good match. "I still think enough of mine, though, that I would like to keep 'em," I said. He decided I was right. When I go through the shop on the night shift I hear a "Hey, John," and look around as he waves his unsleeved arm in the air. I know what he means and we both grin. No, there are things that work better than rules.

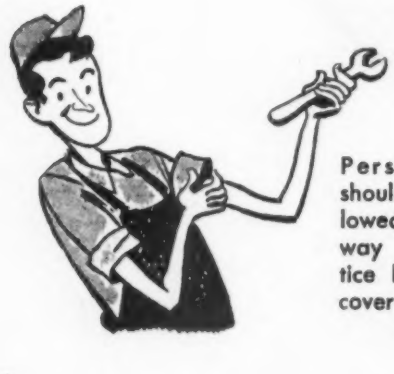
I work in a goldfish-bowl office. My first office was a table, a lamp and a chair out in the shop. Now I have a glass partition around the table and two doors lead into the office, one from the shop, the other from the locker. It's rare when there isn't someone dropping in. "I don't want to stick my neck out . . . but" is the way many conversations start. Then I hear about some unsafe thing a man has observed in his own or another department. "Why don't you tell the foreman?" I ask. After hearing about the neck-sticking-out timidity again, I reply, "Well, if you don't want to take the credit, I will." On my next trip around I "just happen" to see something.

"John must have eyes in the back of his head," I hear somebody say.

An interesting example of the way this ingrained safety works has come up recently in the erection of a new engineering building adjoining the main office. This is done by contractors, of course, and we have no authority over them. When the men go back and forth past this building they see unsafe things and run right to my office and call them to my attention. I can't do anything about it, unless it creates a risk for our own men, but it shows the effect of seed we have planted.

It is impossible to write a fair article on safety at Gisholt without paying a tribute to our top management. While both John Toohey, personnel manager, and I work closely together, we both report directly to George and Stanley Johnson, Claude Swafford and Al Morey, president and vice presidents, respectively. A disabling injury is a personal affair with them. They are thoroughly sold on safety and stand firmly behind anything that promotes the safety of Gisholt employees.

Many Gisholt families, like the Johnsons themselves, have worked in the business for three generations. Safety itself is a family affair . . . "for lack of it affects all."



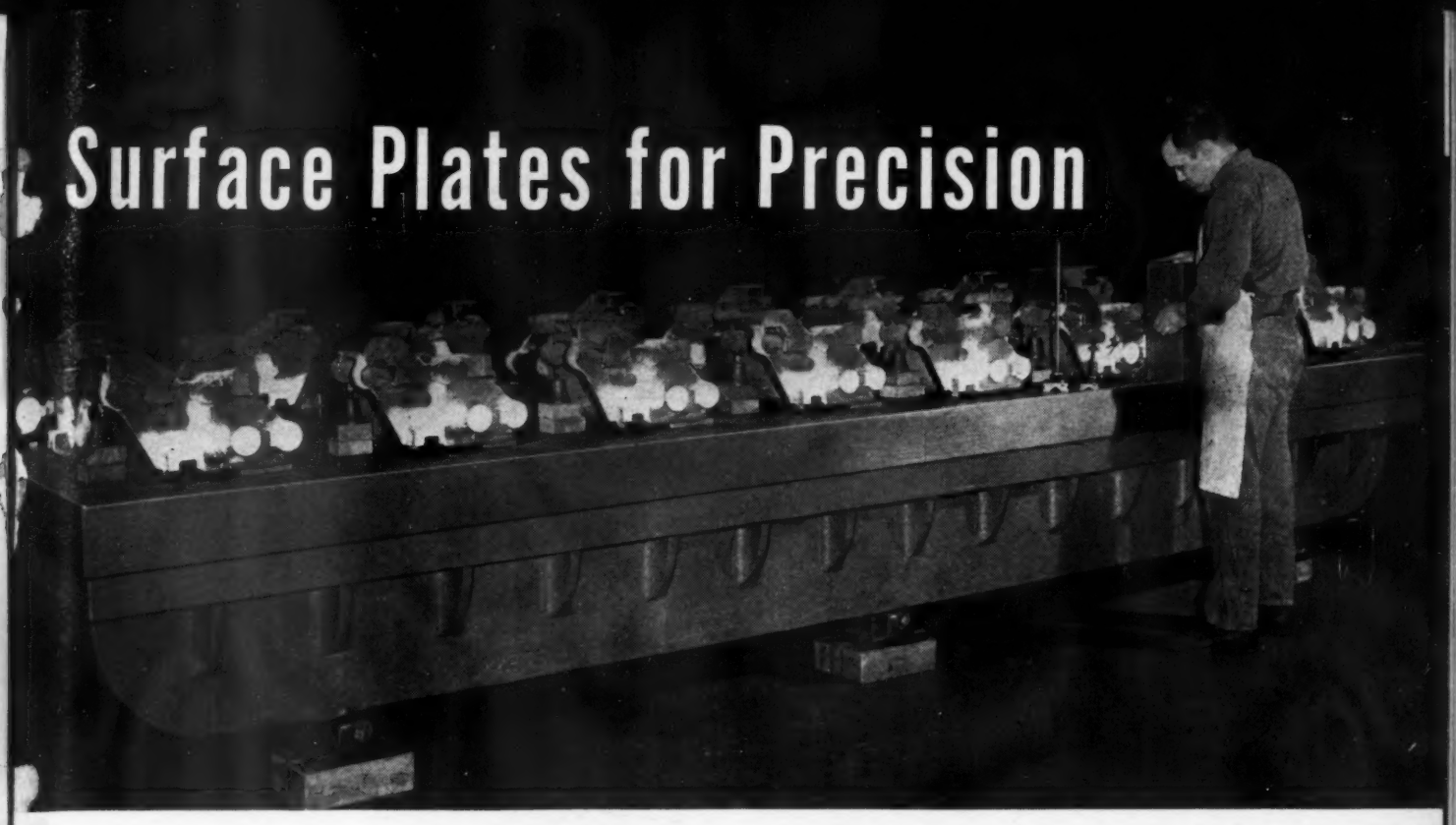
Personal pride should not be allowed to stand in the way of safe practice by attempts to cover up physical defects

SAFETY FIRST PAYS OFF

	Accident Frequency Rate	Accident Severity Rate
1943	28.84	0.284
1944	19.4	0.307
1945	18.69	0.2158
1946 (6 mo.)	8.88	0.073

Note—Figures are actually taken from the Gisholt plant for these periods.

Surface Plates for Precision



TWENTY 80-LB. CASTINGS are arranged on this 6 × 16 ft. surface plate for multiple layout operations. The plate is mounted on six jacks so that it can be kept level easily. After installation, surface plates should be checked for a true level at least once every six months

BY A. M. GRASSE

MANAGER, INDUSTRIAL MANUFACTURING DIVISION, GOODMAN MANUFACTURING COMPANY

Large surface plates, properly installed, save machining time where quantities do not justify the cost of jigs and fixtures

NOT MANY YEARS AGO, almost any kind of metal platform—an old planer table or a table from some other machine tool set up on wooden horses—usually served as a work surface for inspection, layout and assembly operations. Accuracy of the top surface apparently was not considered very important. Today, however, in shops where precision work is a "must" and close tolerances are the rule, precision surface plates usually are the working surfaces from which accurate measurements are made.

Considerable improvement has been made in the manufacture of surface plates, both in materials and methods of machining and finishing. It is not unusual today to find one-piece surface plates weighing as much as 13 tons with a 24-in. depth and a working area of 6 × 16 ft. machined to an accuracy of plus 0.000 in. and minus 0.002 in., measured anywhere on the surface. Plates of this size are used not only for layout and inspection operations on large work, but also to set up a number of small pieces for such operations.

Standard surface plates range in size from the 6 × 16 ft. floor-mounted unit down to 20 × 30 × 6 in. and smaller bench plates. Where extremely large surface areas are required, several plates can be set up in combination. During the war, one plant making Navy gun mounts had a series of 6 × 16 ft. plates joined in multiples of three, giving a total surface of 18 × 16 ft. for each unit, the entire area in each case being within the accuracy limit required.

Optional features in large surface plates made today include lines scribed on close centers and at right angles to aid in aligning parts on the plate surface; T-slots cut at various positions to allow for clamping parts, angle plates or gage units; keyways on the top surface and sides for insertion of keys or straightedges to aid in checking work; and wide flanges around the entire top edge, permitting use of clamps in setting inspection instruments.

While precision surface plates now are available in a wide range of sizes and styles to meet varying shop requirements, it is well for a plant using a number of plates to establish a series of standard sizes. The value of this practice was demonstrated recently by a large motor car manufacturer in using a large number of plates throughout several plants for checking dies, tools and many production parts. A survey revealed that plates of almost every available size and description were in active use and while each served its purpose, there were many instances where wide variations in size were not justified.

In the future, this company proposes to use only three types of plates—one for extremely light work, up to 500 lb.; one for medium work, up to 5 tons; and the third for work

Things to Remember About SURFACE PLATES

1. Keep the surface clean at all times. This is particularly important when the plate is not in active use. Chips, sand and dirt should not be allowed to accumulate. A heavy piece dragged across a dirty surface can cause deep scratches. Waste or a good brush should be available for frequent cleaning of the top surface.

2. If the plate is used for heavy, rough work, it is advisable to set the pieces on parallels or blocks. Such practice protects the surface of the plates and at the same time permits the piece to sit level—roughness or a burr on a casting cannot throw the piece out of level as it might if the casting were setting on a flat surface.

3. When necessary, surface plates can be polished with fine-grain emery cloth wrapped around a machined block of steel. This should be done often enough to keep the surface clean and free of scratches. In the case of nicks, which can be prevented with proper caution, high spots should be filed off with a flat mill file.

4. When the plate is not to be used for 48 hr. or more, or if it sweats because of atmospheric conditions, it should be coated with a half-and-half mixture of light machine oil and kerosene. This mixture is easily applied and is just as easily removed.

5. In addition, the plate should be kept covered when not in use for any length of time. Lightweight plywood covers for the surface are recommended.

6. Be sure to check each surface plate for a true level periodically, at least once every six months, after the first month of installation. This is especially important where conditions do not permit a solid foundation, such as concrete bases.

SURFACE PLATES FOR PRECISION (Continued)

over 5 tons. Width of these standard plates will be 4, 5, and 6 ft.; lengths will be 6, 8, 10, 12, 14 and 16 ft.

Layout of castings, weldments and other parts for machining operations, such as planing, boring and drilling, can be simplified through proper use of surface plates when quantities involved do not justify the expense of making jigs and fixtures.

The first step is to bring the castings to a preliminary inspection and layout section. They are positioned on a surface plate so visible flaws or defects can be found easily. Layout men can inspect and work on the pieces from all sides, and at this stage may accept or reject them for further work.

The second step is to scribe centerlines on the castings or weldments to aid various machine operators in setting up the pieces on their machines. Next, the layout man scribes reference lines for machining. This not only aids the machine operator, but it also determines whether or not there is sufficient stock on the part for machining. If a casting or weldment has insufficient stock at any section, it is marked by the layout man and sent to the welding shop so metal can be added.

Avoids Rechecking Tools

When more than one piece of similar work is being inspected and laid out, a surface plate large enough to handle several pieces is of advantage, as one setting of the surface gages and other layout tools enables the layout man to do the same work on several pieces without rechecking his tools. A layout man performing these operations day after day soon becomes so expert he can, in a minimum of time, make a thorough inspection of a part for defects, lay out the center and reference lines, and determine whether the parts have sufficient stock for machining.

In contrast to this procedure, machine operators would spend many times such effort to perform the same work, and undoubtedly some operations would be performed before flaws or defects were discovered. Stopping a job already on a machine is inefficient, expensive and annoying, particularly when the operator is working on an incentive system. When a part is delivered to the machine operator, setup time is reduced to a minimum if center and reference lines already have been scribed.

After each machining operation, or each series of such operations, the pieces again can be set up on a surface plate for inspection of the completed work. This time the setup is aided by the center and reference lines scribed previously, and inspection is accomplished quickly. Grouping several parts on the surface plates for inspection at one time, of course, has the same advantages as when laying out a number of parts at one time.

Machine tools can earn a return on their investment only when used for cutting metal, and when the operators of these machines spend their time working on machining operations. If such phases of the work as inspection and layout operations are not segregated but are performed by

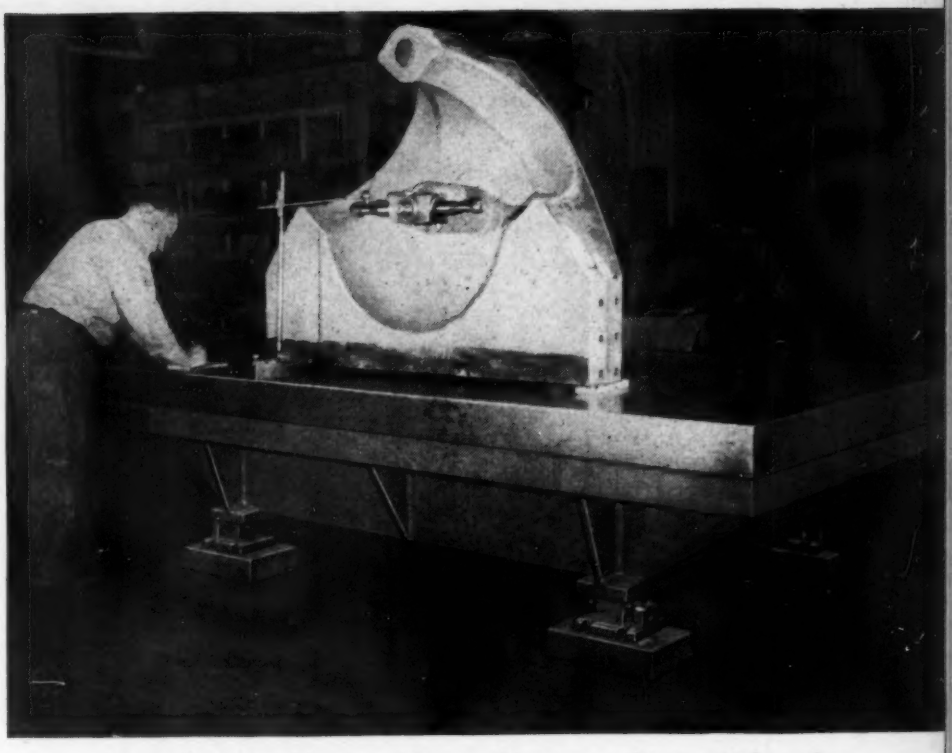
the machine operators, much productive time is lost. An adequate number of surface plates, inspection equipment, and the services of layout and inspection men, quickly pay for themselves through savings in machining time. Their cost per hr. is considerably less than that of a machine tool with an operator.

Surface Plates Must Be Level

Correct installation and proper care of floor-mounted surface plates is important. The floor on which the plate is mounted should be flat and sufficiently heavy to withstand the weight of the plate and the part to be laid out or inspected. Where considerable accuracy must be maintained to meet extreme precision requirements, it is recommended that plates be mounted on concrete bases. Placing surface plates close to vibrating equipment, steam pipes, open flames and other sources of heat, as well as in drafts, should be avoided.

Because surface plates must be kept accurately leveled they should be mounted on leveling jacks set on maple blocks or on concrete bases. Where it is desired to raise a plate higher than its normal working level, additional maple blocks can be used between the floor and the leveling jacks.

After the desired location for a large surface plate is determined, and it is mounted on jacks and wooden blocks, it should be allowed to stand for 24 to 48 hr. before leveling. This permits the plate to reach room temperature. Leveling is done with precision spirit levels, adjusting the leveling jacks to bring the plate level lengthwise and crosswise.



A manufacturer of heavy mining machinery uses this 6 x 10-ft. surface plate to check alignment of a subassembly in this large casting for a coal-cutting machine. Layout men and inspectors can work on all sides of large pieces of this type when they are set up on surface plates

When two surface plates are to be installed together, it is recommended that one plate first be installed and leveled before leveling the second plate. After the first plate has been leveled, keys are placed in the keyways machined in the side of this plate, and fastening bolts are inserted in holes in the skirt. Then the second plate is installed in position alongside the first and at the same elevation, allowing approximately 1 in. between the two plates. The second plate then is leveled in the same manner as the first. Next, the bolts in the first plate are slid into matching holes in the second plate and the two plates are drawn together. To insure uniformity in this latter step, it is suggested that the nuts be tightened simultaneously at both ends of the plate. The final step is to level the combination plate, and it is important that the load on the adjacent jacks at the point should be distributed equally.

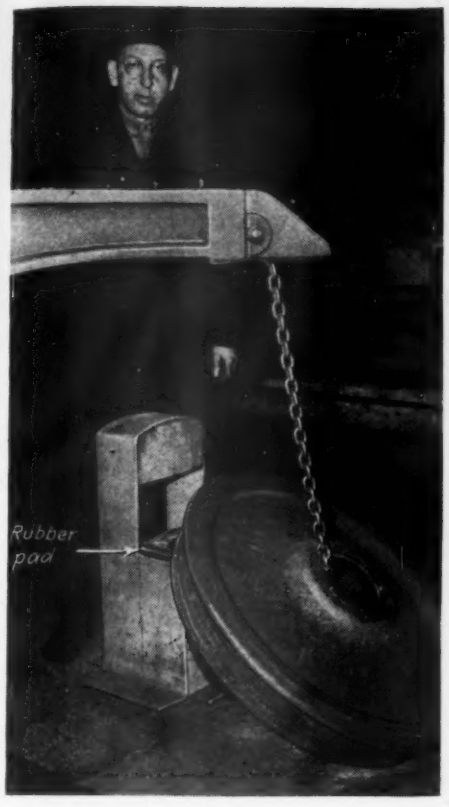
All surface plates should be leveled periodically. For the first month after installation, it is recommended that each plate be checked at least once a week. Thereafter, once every six months should be sufficient. If a plate is allowed to remain out-of-true it can become warped and so lose its accuracy.

Center and reference lines scribed on a piece make it easier for the machine operator to set the piece up for machining, and they help him position his tools quickly. Proper layout of the parts before they are delivered to the machines also insures that the machined surfaces will clean up since parts that do not have sufficient stock on some surfaces quickly are sorted out

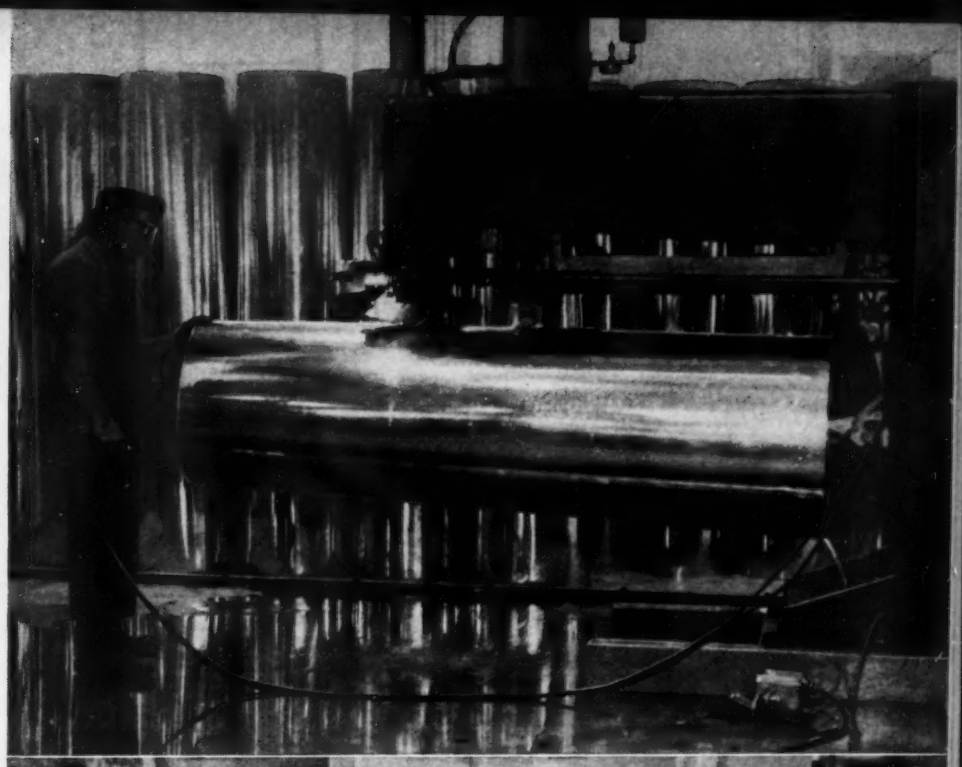
SHOP SHOTS

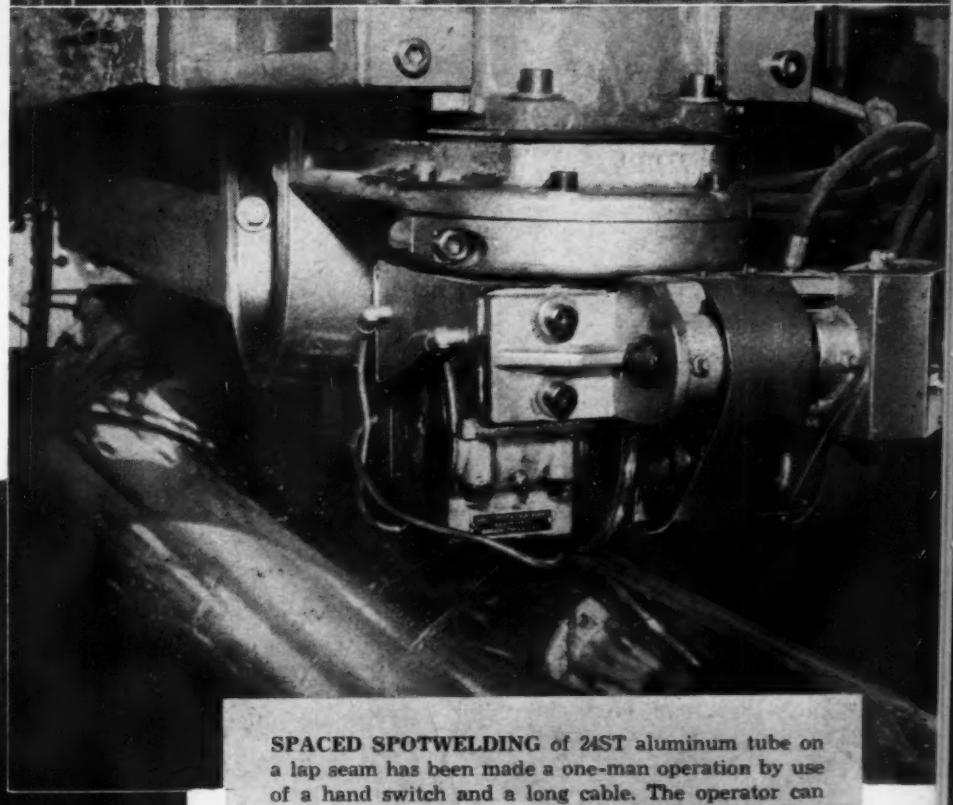
FIBERGLAS BLANKETS, each ½-in. thick, used for insulating Stinson Voyager 150 planes, can be cut ten at a time by a special design of reciprocating electric saw. The material although light in weight is difficult to saw and only a reciprocating blade could dissipate heat fast enough and diminish the high abrasive effect of the work.

CONTOURS IN TWO PLANES, one of the most critical contour-forming requirements, may be made by application of progressive clamping. In this operation, a combination of bending and stretch forming, it is necessary to move up or down the pulling head at the left and clamp the job after the tonnage load has passed a given point of the section. The machine must be started and stopped several times to complete the job. Lever clamps have been most suitable. *The Cyril Bath Company*



WELDED STEEL BLOCKS with renewable rubber pads are now being used at car wheel boring machines to support wheels while the hoist chain is fastened. The pads, which are cut out of rubber belting, may be readily fastened to the resting block to keep it in service indefinitely. *Erie Railroad Company.*





SPACED SPOTWELDING of 24ST aluminum tube on a lap seam has been made a one-man operation by use of a hand switch and a long cable. The operator can easily feed and guide the work without the aid of a helper. On this operation the time cycle is 4 on and 24 off at a speed of 3 fpm. Approximately 16,000 amp. is required. *Thomson Electric Welder Company*

AUTOMATIC INDICATION OF ENAMEL THICKNESS on stove parts is reducing rejects, increasing production and saving more than $600 a month at the Florence Stove Co. Thickness of enamel cannot vary more than 0.0015 in. on the various parts. Formerly the parts were matched visually after the enamel was baked on. Now by getting the exact thickness of enamel shades of white are perfectly matched. If uniformity is not held the enamel can be washed off and the part resprayed. *General Electric.*

Full-Wave Rectifiers

A HALF-WAVE rectifier circuit has a primary winding feeding a single secondary winding, connected to the rectifier and load. This gives a zero-voltage interval in the curve, which occurs when the secondary voltage is negative.

If another secondary winding is added to the transformer and is connected to a second rectifier tube conducting on the other half-cycle, then these two circuits produce dc. wave forms which are directly opposite in phase. That is, the zero-voltage interval produced by the upper circuit occurs at the same time as the positive loop produced by the lower circuit.

If these two circuits are combined so that the load is common to the output of both rectifiers, the combined voltage wave forms presented to the load show that the former zero-voltage interval has now been filled in. Therefore, this system is called full-wave rectification, because both halves of the ac. cycle are rectified. Often the two rectifier elements are combined in one envelope with a common cathode and heater.

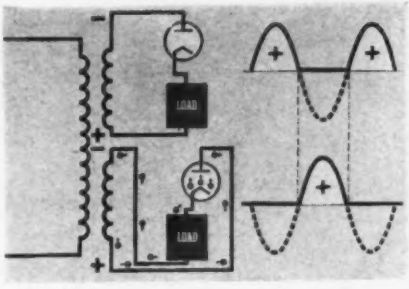
This kind of circuit is often used to supply a constant dc. for motor fields whose high inductance acts as a filter to smooth out the current ripple.

Another form of full-wave rectification is the bridge circuit. This circuit can be designed to handle extremely high voltage, and uses only a simple transformer construction, feeding four rectifier tubes.

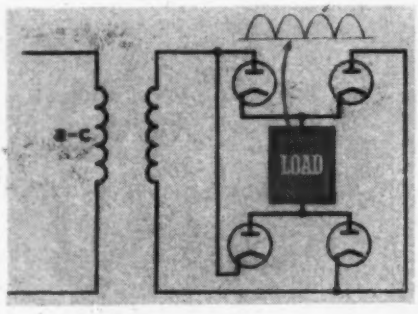
Bridge Rectifier

In the bridge rectifier, four tubes and a single secondary winding are employed. In order to supply power to the load on both halves of the ac. cycle, rectifier tubes are connected to both ends of the secondary.

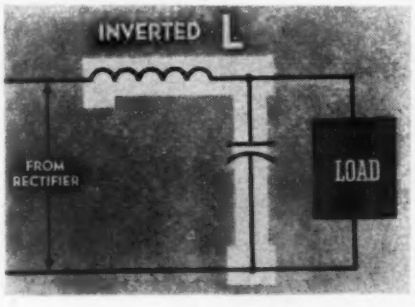
In operation, when the upper end of the transformer is positive, electrons will flow from the negative end of the transformer, through the bottom tube, through the load, and then through the top tube back to the positive end of the transformer. When the upper end of the transformer becomes negative, this flow ceases.



An additional secondary winding can be connected to a second tube to produce the opposite phase



The bridge circuit using four tubes can supply twice the voltage of a simple pull-wave rectifier



The inverted L filter is so called because its circuit diagram looks like an inverted L

The other two rectifier tubes are added to eliminate the zero-voltage interval, when the upper end of the transformer is negative. They are connected so that electrons will flow through the load in the same direction as before, but during the second half of the ac. cycle.

If the action is combined into a completed circuit of four tubes, the dc. voltage wave form applied to the load shows a full-wave rectification of direct current. For a given transformer and tube type, this bridge-type rectifier circuit can supply twice the dc. voltage supplied by a simple full-wave rectifier, but requires four tubes instead of two.

Filters for Uniform Current

The dc. voltage taken directly from the output of the rectifier tube with, perhaps, the addition of a storage capacitor, provides sufficiently uniform dc. for many purposes. However, for applications that demand a uniform direct current, the output of the rectifier tube must be passed through an electrical network called a filter.

The two filter systems most commonly used are the inverted L and the Pi. Both systems use the same fundamental units: the capacitor, which, as a result of applied voltage, stores energy to be released back to the electric circuit; and the inductance, which stores energy as the result of current flow, and returns it when flow diminishes.

The inverted L filter is so called because its circuit diagram appears very much like an inverted L.

The pulsating current coming from the rectifier first reaches the inductance, where the rising current must store energy. This energy is later returned when the current falls. Thus the energy in the inductance smooths the current.

Next, the capacitor, connected in parallel with the load, removes most of the remaining power ripple by storing energy on the voltage rise and releasing it as the voltage drops. This combined action produces a practically constant or pure direct current to the load.

The Pi filter uses two capacitors and an inductance arranged to resemble the Greek symbol Pi. The filtering action of this circuit is similar to the inverted L but is more effective.

The voltage from the rectifier is somewhat smoothed by the first capacitor before it reaches the inductance and final capacitor. Any capacitor input circuit such as this, although having a higher output voltage, draws its energy as high pulses of current during the peak of the voltage cycle. In doing so, it places a strain on the rectifier tube which tends to shorten its life.

Based on a sound slidefilm in the General Electric industrial electronics course.

Practical Ideas

Precision Angle Checking Without Special Equipment

DON CAMPBELL

Drill rod, "best wires," and other odds and ends of hardened bar stock are available in many sizes. If you have a fair assortment of short pieces of these around plus two precision squares and a surface plate, you can tackle any job from less than a degree up to 90° for any size work from an inch up to the maximum size the surface plate can take.

Near the edge of the surface plate clamp a long piece of angle iron, ground to a good straight and square surface. Maybe you have a couple of angle-plates and can obtain the same result by clamping a good flat plate with the two angle-plates.

Select a couple of hardened and ground, perfectly round and straight cylinders, which, when spaced about the maximum length of the work, will elevate it to about the desired angle. (Check with a 10c protractor.)

Clamp a square against the vertical plate by the blade so the stock projects, and lay one cylinder against its outer edge. Clamp the other square in the same way so the outer edges of the stocks are parallel and facing each other. Determine the distance between the stocks by the cotangent formula (Case I, below) and adjust the position of the second square with an inside micrometer. Place both cylinders in position and be sure the stocks of the squares are high enough to be tangent, if not, block the squares up. Insert spacers and a couple of coil springs to hold the cylinders lightly against the squares. Lay the work on top of the cylinders and clamp to the angle plate.

This method has many advantages:

1. It eliminates extra equipment and tools, but doesn't introduce extra calculating.
2. The range of size, both of the work and the angle, is unlimited and the method is adaptable to any kind of work without a lot of extra gadgets, because this equipment is built-up from standard stock to suit the particular job. For very small work, you use "best-wires" and small squares. For large work, you might use some engine pistons.
3. There are no joints or surfaces to wear out; there are no critical dimensions. There is nothing to make or buy. The accuracy is all in the measurements in the setup.

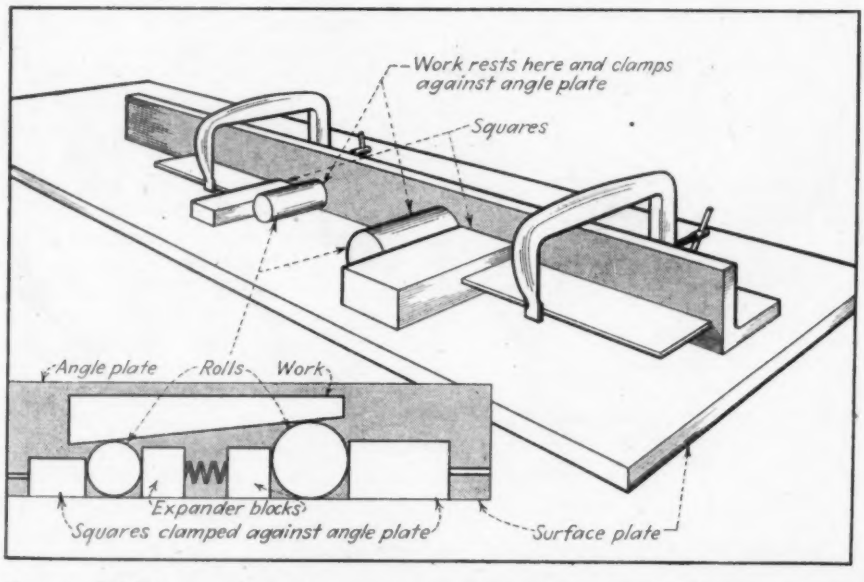


Fig. 1—Odd-sized rolls, two squares, surface plate, angle plate, and micrometer are the requirements for this angle-testing setup

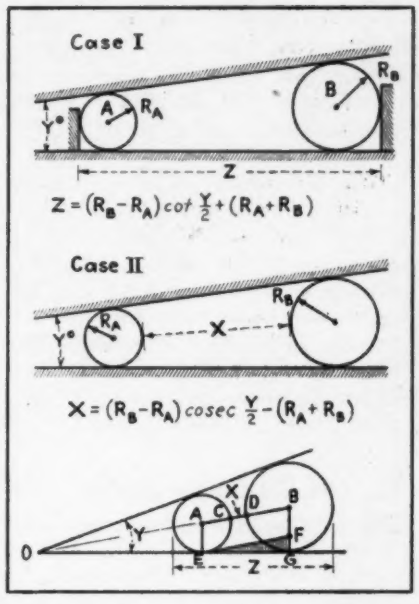


Fig. 2—Derivation of formulas

A geometrical analysis of the setup will explain the principle and the potential application. Two alternative formulas are given either of which will solve any problem, but if the equipment is used extensively, certain cylinder or roll sizes can be made standard and a table prepared giving the necessary data to check any frequently occurring angle.

Referring to figure 2, notice these geometrical facts: 1. The line of centers of the two rolls bisects the angle Y. 2. Line EF is constructed parallel to the line of centers so

the angle FEG is the same as angle BOG, or half angle Y. 3. Distance FG equals the difference between the radius of B and the radius of A, because BF equals AE.

If you want to work the problem by the distance between the squares (Case I), the important dimension in the triangle will be EG, the long leg. If you use the distance between rolls (Case II) you want the hypotenuse, EF. EG/FG is the cotangent of the half-angle and EF/FG is its cosecant.

The procedure, then, is this: select the proper rolls to obtain the desired angle with about the right spacing between rolls. Look up the cotangent or cosecant of the half angle and also calculate the sum and the difference of the radii. Multiply and add or subtract, according to the formula and set your inside micrometer to this reading.

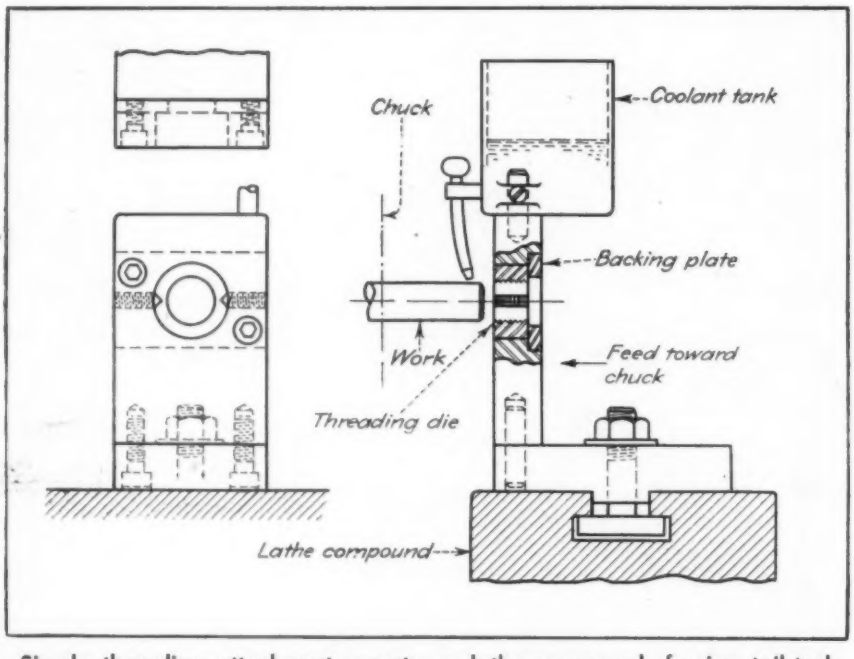
Tap and Die Holder Speeds Short Lathe Threading Jobs

B. MOGAL

An angle plate is built up from cold-rolled steel fastened together with two screws and two dowels. The horizontal plate is fitted with a key for the slot in the compound rest and bored for the bolt. The vertical plate is bored to take the largest die size while the assembly is mounted on the compound to insure accuracy. A slot is then milled across the back face of the vertical plate to receive the backing plate, held in place with recessed socket cap-screws. The hole in the center of the backing plate is only to provide work clearance.

Setscrews in the sides of the plate prevent the die from rotating but axial thrust is taken entirely by the backing plate. A coolant tank can be mounted atop the fixture.

Smaller dies and taps are accommodated by providing an assortment of bushings to grip the tools and in turn be gripped in the angle plate.

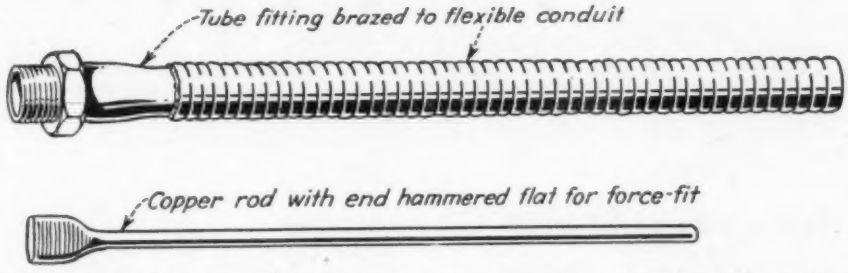


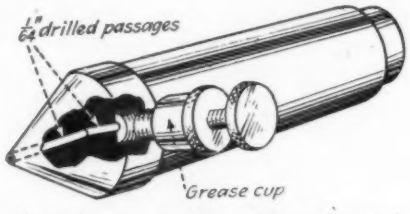
Simple threading attachment mounts on lathe compound, freeing tailstock for other operations on the same piece

Flexible Conduit with Stiffener Makes Coolant Nozzles

HARRY DARBY

Electricians' B-X conduit with a suitable tube fitting soldered or brazed into one end will carry liquids without leakage at zero pressure, but if different nozzle positions are required for different jobs, the conduit is too flexible to stay put. Therefore, I inserted a small copper rod hammered flat at one end into the conduit. The flat part should be forced into the tube fitting until it is securely wedged in place, without obstructing the liquid flow any more than necessary. Then the nozzle can be bent as required and the copper stiffener will keep it there. The copper should be about 2 in. shorter than the conduit to allow the stream to reform inside and pour out smoothly.





Mounting a grease cup on the tailstock center simplifies lubrication

Grease Cup And Drilled Passages Lubricate Tailstock Center

G. B. BRODSHAR

Forgetting to oil the tailstock center is easy and the results sometimes rather disastrous. One day, I decided to solve this annoyance for once and for all.

The point of the center was knocked off and a 1/64 in. hole was drilled along the central axis deep enough to meet another hole drilled in from the side, back of the 60° point. Depending on the size of the lathe and the center and on the spare parts available, the side hole is drilled out and tapped to receive a suitable grease cup. On a large lathe a 1/8-in. pipe grease cup will fit directly. For a No. 2 Morse Taper center, it may be better to thread a 1-in. length of 3/16-in. brass rod and tap a hole in the center at an angle and then drill the 1/64-in. hole clear through, so as to mount the grease cup back and away from the work.

If the machine has a lubrication

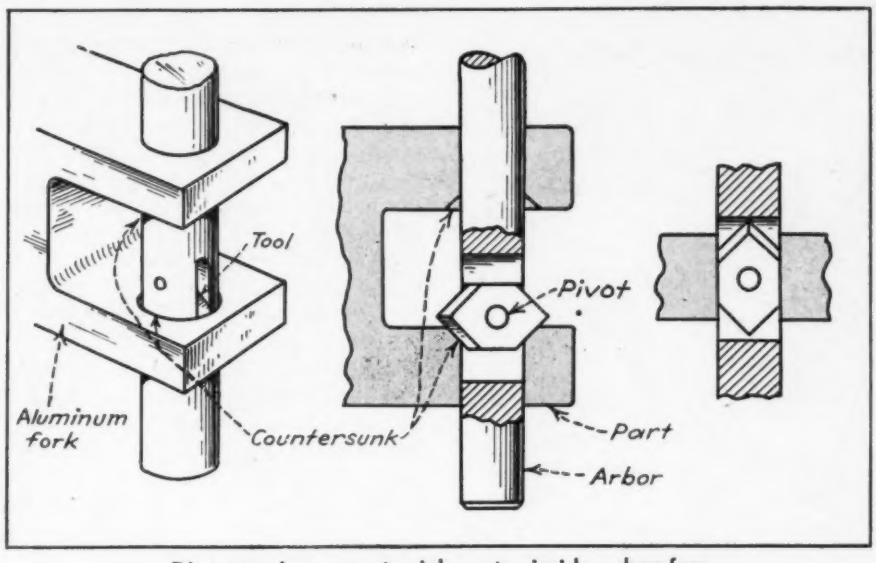
system of any kind, the center can be connected to it with a flexible jumper and a needle valve installed to meter the flow.

Double-Edged Countersink Works Both Ways

CHARLES KIDWELL

Chamfering the inside and outside of aluminum forks around the hole was speeded with this special countersink. The centrally slotted bar is a good running fit through the hole and its cutter is just narrower than the bar diameter when it is retracted. Thus, the countersink, chucked in a drillpress, can first chamfer the top surface, retract and enter the work, chamfer the two inside surfaces, retract and come out again, and do the other outside surface when the fork is turned over.

To resharpen, drive the pin and hand-grind, carefully checking angles and equal dimensions to assure even cutting.



Disappearing countersink cuts inside chamfers

Clamp Holds Bar Stock on Bandsaw Cutoff Attachment

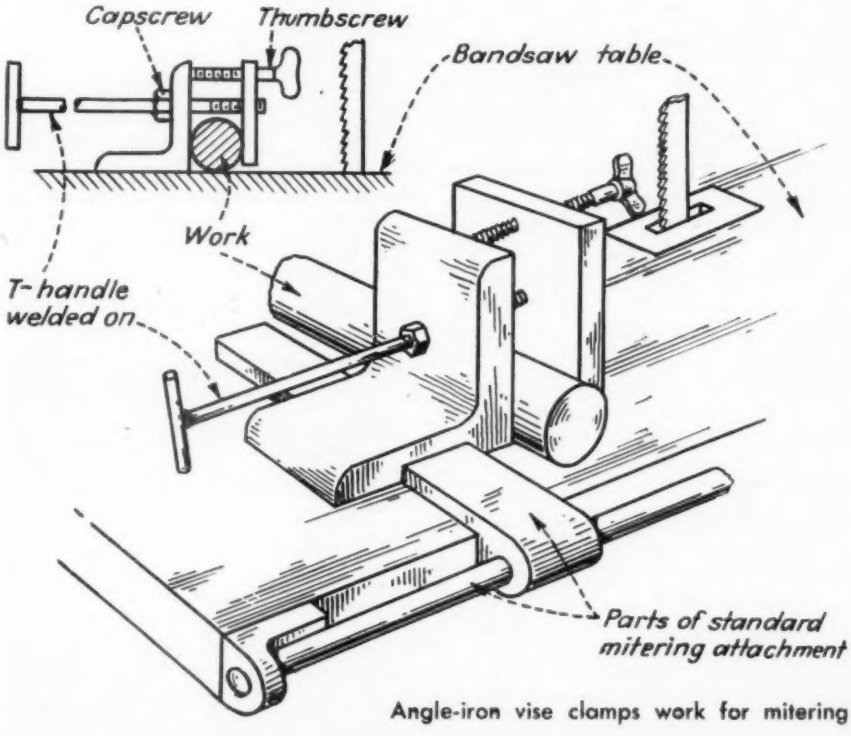
JOHN C. FRANK
Foreman, C. Hager Hinge Mfg. Co.

Sawing tubing, pipe, and bar stock on the bandsaw without a clamp is not only inaccurate, it's dangerous. Right-angle cuts on square, rectangular or hex stock aren't too hard to hold because there isn't much tendency to turn or slide endwise, but just try to cut a 45° bevel tubing.

This "attachment" to the commercial bandsaw attachment does the trick. First, a vertical extension was made above the standard guiding plate. Another plate, equal to the combined height of the guide plate and extension when standing on edge makes the clamp. Opposed screws, one through the guide-plate extension and into the clamp plate, the other tapped through the clamp plate and butting on the extension, operate the clamp.

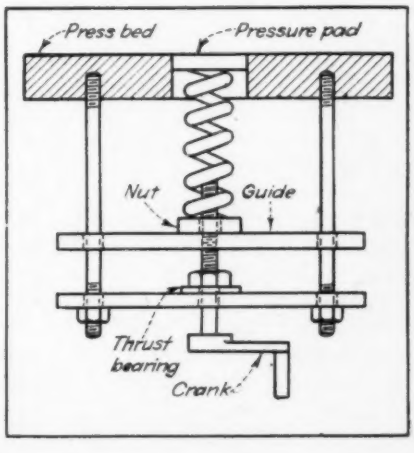
In setting the clamp to cut a lot of pieces from the same bar, adjust the lower screw first, with the thumbscrew backed off and the plate about parallel to the work guide. Adjust work and tighten with the thumbscrew. Work can be loosened and readjusted with a quick turn of the thumbscrew, and all danger on account of hand-held work is eliminated.

In building the clamp, bear in mind that the height of the lower screw above the table limits the diameter of the work that can be clamped.



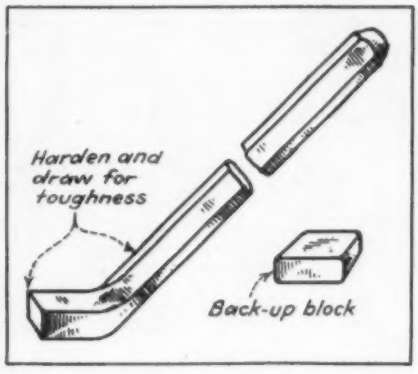
Angle-iron vise clamps work for mitering

Spring Pad For Punch Press—Formerly four bolts had to be adjusted to bring the pressure pad into operation or to remove it. Now, the pad is permanently attached to the press and a hand crank raises or lowers the pad easily. With the nut and guide down, the spring itself can be slipped out, providing clearance for other work. *Gerald T. Jindea.*

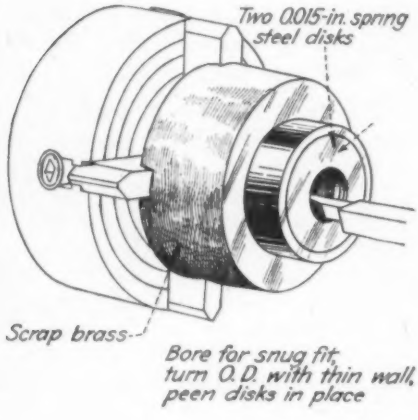


Hints on Small Tools

EARL R. GODDARD

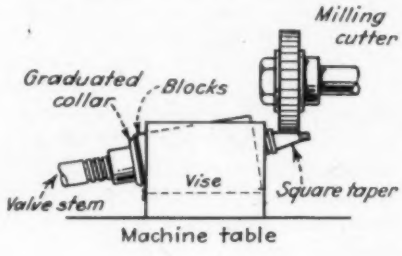


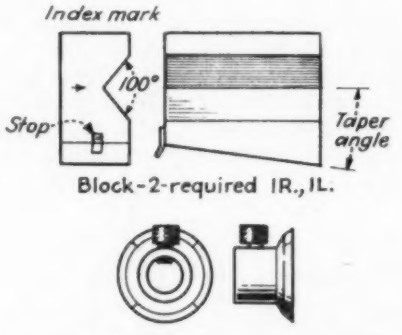
Key Drift—I have found this bent drift very handy for removing tight keys. (The bend gives more room to swing a hammer and affords clearance for other parts that may be on the same shaft). A piece of 1-in. chisel steel was flattened, bent and ground to make a nice, free fit in the keyway. A short backing-block of cold-rolled steel, hardened and ground may be helpful in extending the range of the drift.



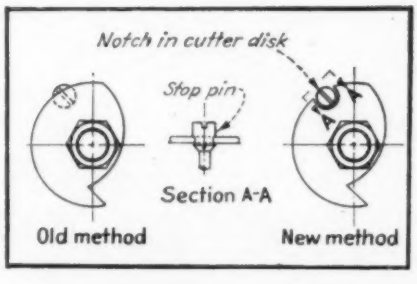
Boring Thin Valve Disks—Chucking two 0.015 in. spring steel disks for reboring was accomplished by making a special "collet." A short stub of old brass bar stock was chucked, faced off and bored to the disk O.D. about 1/16 in. deep. Then the outside of the brass was turned down leaving a wall about 1/8 in thick. The disks were inserted in the counterbore and the brass lightly riveted over to hold them. When the boring was completed, the work was removed by turning down the outside wall.

Machining Square Tapers—Handwheel seats on globe valve stems were refinished in one shop with the help of a special fixture. Mating V-blocks with the bottom edge cut away relative to the Vee at the desired taper-angle holds the stems during shaping. A collar with 4 marks, 90° apart, slips over and clamps on the valve stem at the correct distance from the beginning of the taper; and the collar-face bears against the face of the V-blocks. A mark on one of the V-blocks acts as an index, so, turning the collar (and valve stem) one mark at a time, assures 4 flats at right angles, all at the correct taper.

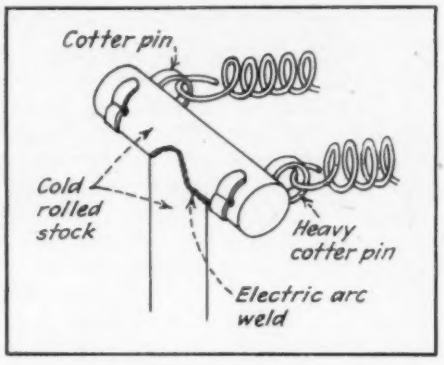




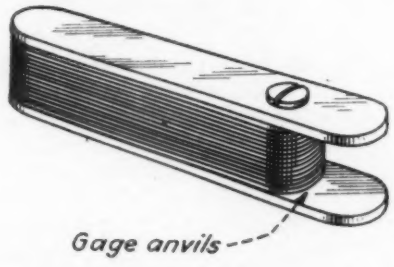
Pipe Cutter Lock—Blades held only by the end nut would turn on the bolt and have to be adjusted several times a day until this addition was made. A short rod was welded atop the screw, making it, in effect a fillister head, instead of a flat-head screw, and a notch was cut in the back edge of the cutting disk so the screw extension would key the cutter in place. *Eugene J. Roy.*



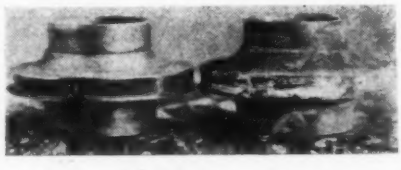
Spring Anchor—Cotter pins make a handy holding device for coil springs used on special tools or equipment. Springs are securely held but can be easily removed or replaced when necessary. *Chester Ricker.*



Gap Gage—Fairly heavy ground flat stock made into cover plates for a feeler gage can make it do double duty as a caliper or "gap" gage. The bolt should be one that can be removed easily to permit adding or subtracting feelers to make the desired dimension. *Arthur F. Hird.*



Cleaning Pump Impellers — Pump and valve parts subject to corrosive conditions and accumulated salt scales of various kinds can be kept in or restored to perfect condition by immersing in a weak solution of hydrochloric or muriatic acid. *John Joseph Ferguson, Anaconda Copper Mining Company.*



Tightness of Swaged Pins—Trying them individually by hand was slow and unreliable, believe it or not, compared to merely dropping the assembly on a sounding board. The difference in noise easily separated the loose from the tight, saving many man-hours. *William F. Wiebach.*

Understand the Lathe Threading Dial to Get Its Full Advantage

W. W. QUIST

Anyone who has cut threads on a lathe knows that when the threading dial is correctly used it will enable the operator to close the half-nuts at the desired point on the lead screw. In some instances the dial is also useful for accurately indexing for cutting multiple threads. However, it is necessary to fully understand the principle of operation before one can determine whether or not such indexing can be accomplished by merely using the half-nuts and the lead screw.

Ordinarily, the threading dial is divided into quadrants, *i.e.*, four equal parts. Each quadrant represents 1-in. on the lead screw and there are as many teeth on the pinion as threads per inch on the lead screw, as illustrated by Fig. 1. For convenience, and as many lathes have six threads per in. on their lead screws, such a lathe will be discussed. The same method of analysis can be used for any lead screw of another pitch.

Many operators know that the half-nuts may be closed at any point when chasing threads which have a number of threads per inch (TPI) equal or a multiple of the lead screw. Thus for a lead screw having 6 TPI, the half-nuts can be closed at any point when chasing 6, 12, 18, 48, etc., TPI. The reason can readily be explained by studying the top drawing in Fig. 2 where the crest of each thread of the lead screw coincides with a crest of the screw being cut. Therefore, regardless of where the half-nuts are closed, the tool will travel in the original groove.

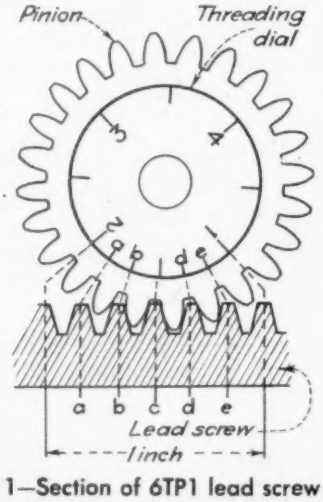


Fig. 1—Section of 6TPI lead screw and 24-tooth pinion showing graduations

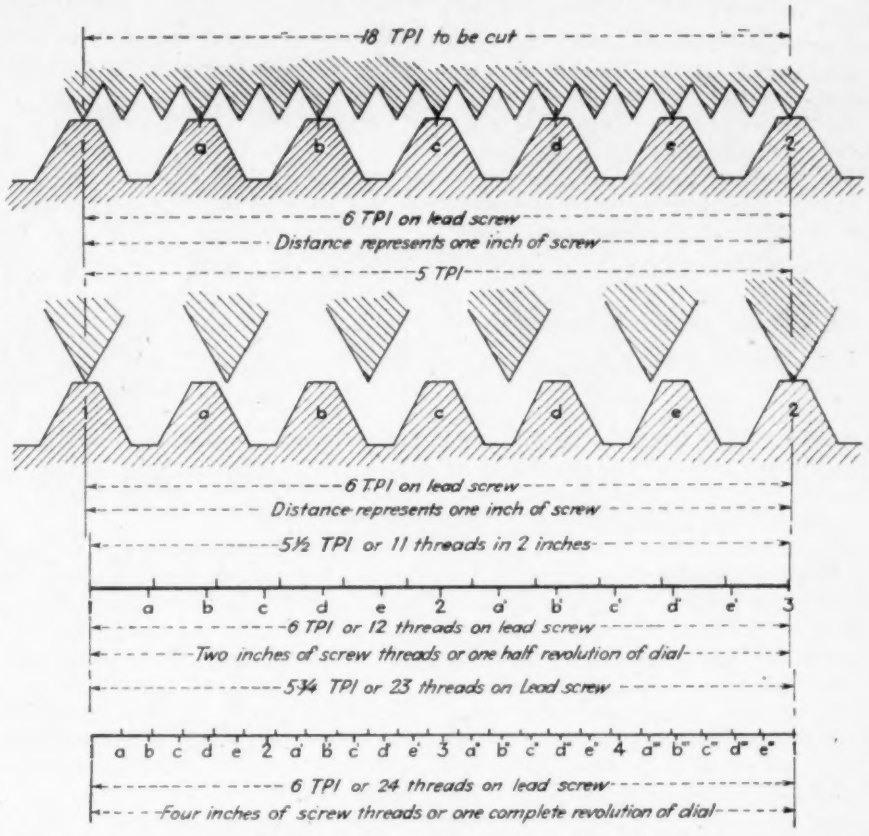

18 TPI to be cut
6 TPI on lead screw
Distance represents one inch of screw
5 TPI
6 TPI on lead screw
Distance represents one inch of screw
5½ TPI or 11 threads in 2 inches
6 TPI or 12 threads on lead screw
Two inches of screw threads or one half revolution of dial
5¾ TPI or 23 threads on Lead screw
6 TPI or 24 threads on lead screw
Four inches of screw threads or one complete revolution of dial

Fig. 2—Top, to cut a thread which is a multiple of the lead screw, engage the half-nuts anywhere; center, to cut an odd-numbered tread, engage only on numbered lines. Fractional threads require engagement at every other number, or every dial revolution for halves and quarters

In like manner it can be shown that for even numbered threads not a multiple of the lead screw, the half-nuts must be closed at any ½-in. point on the lead screw or any line on the dial. Not to do so (to engage at the intermediate points "a,b,d,e" of Fig. 1) would result in a multiple thread of three starts or triple thread. On a 4 TPI lead screw a lead for 10 TPI could be used to cut a double thread with a pitch of 1/20 in., for on such a lead screw there is but one intermediate point between the graduated lines.

As another illustration, let us consider what would happen if the lathe were arranged for cutting an odd number, say 5 TPI with the 6 TPI lead screw. For all odd threads the half-nuts must be closed at a numbered line if the first cut was made on a numbered line. The second sketch clearly illustrates that only at a numbered line of the dial do the crests of the two threads coincide. Therefore, with such a set-up, to close the half-nuts at a line not numbered, as "c," Fig. 1, the result would be a double thread with a pitch of 10 TPI. Also, since the half-nuts can be closed at points "a,b,d and e" of the dial it would be possible to get six starts and a 1/30-in. pitch.

The same procedure can be used to explain why half-threads (5½ TPI, etc.) require that the half-nuts be closed at two-inch intervals of the lead screw or half revolution of the dial. Similarly, a quarter-thread (5¾ TPI, etc.) requires a full revolution of the dial or the use of the same line of the dial for all cuts. For these illustrations it is necessary to lay out 2- and 4-in. portions of the lead screw respectively and all intermediate points instead of 1 in. as for all whole-number threads.

Two-Piece Punch—To save regrinding time, we make our punches with detachable tips. The shank part, pressed into the punch holder, is left soft, and the hardened tips, then, are easy to remove and grind. *Walter Dimitruk.*

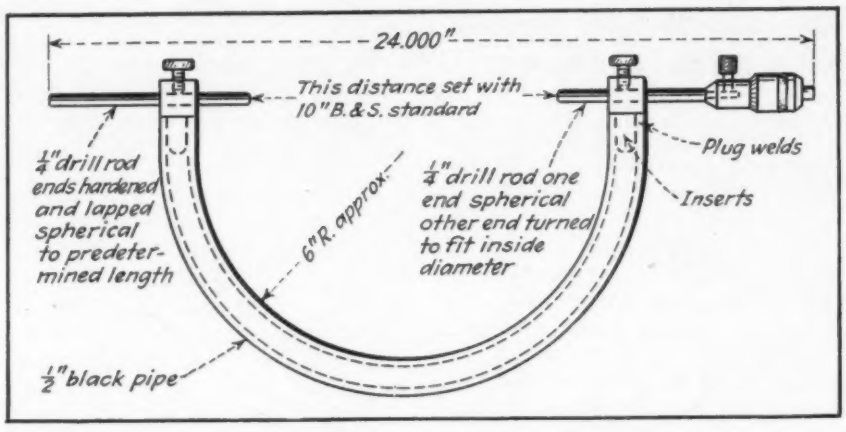
Drillpress Reverse—With a reversing switch mounted right on the drillpress spindle-housing, the operator has fingertip control over shallow drilling and tapping operations. We used this idea on some very heavy work, with a back-geared drill, and cut the time about 75%. *Oscar Craft.*

Adjustable Inside Micrometer Fits Around Boring Bar

H. W. CUTTING

While boring 24-in. holes in some heavy castings it was desirable to find a way to measure the diameter without disturbing or removing the boring bar.

This adjustable micrometer is the result, and it proved itself not only on that job, but on many more as well. A piece of ½-in. black pipe was bent into a U large enough to fit around the boring bar and plugs were welded into the ends. Quarter-inch drill rods were fitted into line-bored and reamed holes through the plugs. One of the drill rods was turned down to fit into an inside micrometer head and its other end turned spherical, hardened, and lapped. The other drill rod had both ends rounded, hardened, and lapped.


24.000"
This distance set with 10" B. & S. standard
¼" drill rod ends hardened and lapped spherical to predetermined length
6" R. approx.
¼" drill rod one end spherical other end turned to fit inside diameter
Plug welds
Inserts
½" black pipe

Black pipe C provides new uses for an inside micrometer set

The lengths of the two drill rods should be such that when set up in the pipe frame, a 10-in. length standard will set the instrument for zero at 24.000 inches. Of course, any base dimension, which in this case happens to be 24 in., can be set by any other outside measurement without regard to the length of rods or distance between them. In fact, one of the beauties of the instrument is its unlimited extensibility. The hole in the micrometer end of the pipe might just as well be made to fit the standard inside micrometer rods, eliminating the necessity for making a special rod or rods. Then, with an assortment of rods to choose from in 1-in. steps, and a standard rod in the other end, and another standard rod to get the in-between distance, a 2-to-12 standard inside mike set can be immediately extended to include any dimension by using suitable spacers.

The set can be used as an outside caliper, too, by merely reversing the micrometer head so it's inside the C. This may be found particularly useful in outside-calipering a small dimension, say 2 in., where a deep throat mike is required.

NOW... $25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

Until further notice, an extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Thirteenth Selection—E. Kraus's Boring-Mill Toolholder

Effectiveness of Cutting Oils—I

STUDY of the action of cutting fluids has thrown light upon the effects of various ingredients such as sulphur, sulphurized fats, and chlorine upon metal-cutting operations and various metals. For example, a controlled test was run on threading hardened SAE 3140 steel (280 Brinell), a relatively clean-cutting steel at this hardness. As shown in Table I, sulphurized mineral oil out-performed lard oil and a mineral-lard mixture in terms of longer chaser life, better finish and longer chaser wear.

The nature, rather than the percentage of sulphur, or total sulphur content, has an important bearing upon characteristics of a cutting oil. It is thus necessary to distinguish between inactive natural sulphur present in a mineral oil, the very active sulphur added in sulphurizing processes and the less-active sulphur present when a sulphurized fat is incorporated in a blend. Table II discloses that a straight mineral oil containing a high percentage of natural sulphur is not a cutting oil. Sulphurized mineral oil containing little more total sulphur gave better finish and less chaser wear. Maximum performance was given by a blend of straight mineral oil and sulphurized fat.

Tests reported in Tables I and II were run at 25 sfpm. with tangential chasers.

Hot-rolled, low-carbon steels are draggy, have a tendency to tear and are difficult to finish. Table III shows the effectiveness of sulphurized mineral oil and the blend of straight mineral oil and sulphurized fat was reversed (compared to SAE 3140) when threading SAE 1020 at the same speed. Thus, machining of clean-cutting steels, cold-drawn low-carbon stocks, free-cutting manganese steels and high-sulphur screw stocks is done most efficiently with a blend of straight mineral oil and sulphurized fat, and the hot-rolled low-carbon steels and most medium-carbon steels (perhaps to 250 Brinell) with sulphurized mineral oil.

Chlorine additions are effective in machining operations because they:

Condensed from a paper "Trends in the Development and Application of Cutting Fluids," by James T. Beard, Jr., Staff Engineer, Technical Division—Industrial, Socony-Vacuum Oil Company, and presented at the semi-annual meeting of the American Society of Mechanical Engineers.

Table I—Effectiveness of Three Cutting Oils When Threading SAE 3140

Item	Lard Oil	Mineral-Lard Oil	Sulphurized Mineral Oil
Viscosity, S.S.U. at 100 F.	195	151	156
Sulphur, total %	——	——	3.16
Lard Oil, %	100	40	——
Tool Life, min.	2	2	39
Finish	Passable	Passable	Fair
Chaser Wear, in. per chaser per min.	28.2×10^{-3}	18.5×10^{-3}	2.7×10^{-3}

Table II—How Sulphur Content in Oils Affects Threading SAE 3140

Item	Straight Mineral Oil Containing High Percentage of Natural Sulphur	Sulphurized Mineral Oil	Blend of Straight Mineral Oil and Sulphurized Fat
Viscosity, S.S.U. at 100 F.	155	156	169
Sulphur, total %	2.43	3.16	1.49
Sulphurized fat, %	——	——	6
Tool life, min.	54	39	90
Thread finish	Poor	Fair	Good
Chaser wear, in. per chaser per min.	9.0×10^{-3}	1.3×10^{-3}	1.5×10^{-3}

Table III—How Sulphur Content in Cutting Oils Affects Threading SAE 1020

Item	Blend of Straight Mineral Oil and Sulphurized Fat	Sulphurized Mineral Oil
Viscosity, S.S.U. at 100 F.	169	156
Sulphur, total %	1.49	3.16
Sulphurized fat, %	6	——
Tool life, min.	72	55
Thread finish	Just Passable	Good
Chaser wear (in. per chaser per min.)	0.6×10^{-3}	0.5×10^{-3}

Table IV—Effects Produced by Adding Sulphur and Chlorine to Sulphurized Mineral Oil Used in Threading SAE 1020

Item	Sulphurized Mineral Oil	Blend of Sulphurized Mineral Oil & Sulphurized Fat	Blend of Sulphurized Mineral Oil & Sulphurized Fat & Chlorine
Viscosity, S.S.U. at 100 F.	156	173	162
Sulphur, total %	3.16	4.30	2.92
Sulphurized fat, %	——	6	2
Chlorine, %	——	——	1.23
Tool life, min.			
S.A.E. 1020	55	79	63
S.A.E. 3140	39	50	50
Finish			
S.A.E. 1020	Good	Very Good	Good
S.A.E. 3140	Fair	Passable	Passable
Chaser wear, in. per chaser per min.			
S.A.E. 1020	0.5×10^{-3}	0.3×10^{-3}	0.8×10^{-3}
S.A.E. 3140	2.7×10^{-3}	2.5×10^{-3}	2.8×10^{-2}

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"File Testing" to insure uniform cutting edges on fast cutting, long lasting Starrett hacksaws and band saws.

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STARRETT, master makers of precision measuring tools, use their skill and expe-

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Your mill supply distributor will gladly supply the one best Starrett hacksaw or band saw for any given job.

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Effectiveness of Cutting Oils—II

(1) provide exceptional film strength, (2) are chemically active at lower temperatures than sulphur, and (3) seem to activate sulphur. Available non-toxic chlorinated materials do not apparently improve the performance of blends of sulphurized mineral oil and sulphurized fat. Table IV indicates that performance is impaired when cutting SAE 1020, and there is no improvement for SAE 3140.

On the other hand, chlorine added to a blend of straight mineral oil and sulphurized fat seems to improve performance, Table V. However, effectiveness of chlorine on threading operations is open to question, but is beneficial or other operations.

Common oiliness agents consist of lard oil and sperm oil. These materials have no special pressure-resisting properties and are limited to protecting the "boundary area" of a tool, namely, the clearance face immediately below the cutting edge. Only durable sulphide films can resist the rubbing action of the chip on the cutting face. Sulphurized fat, also used as an oiliness agent, has the advantage of exceptional extreme-pressure properties. Blended with sulphurized mineral oil, it has been more effective than blends with lard oil, Table VI.

Most effective oiliness agents are synthetic materials. When blended with sulphurized mineral oil their performance is practically equal to that of sulphurized-fat blends, and they have no objectionable odor.

Effectivenes of chlorine in threading is dubious, as mentioned. This is confirmed by Table VII. In drilling hardened NE 8640 steel, however, chlorine is definitely helpful, as seen in Table VIII.

PRESENT TRENDS:

1. There is a trend toward the use of light-colored, odorless cutting oils—both corrosive and non-corrosive.

2. More attention is being directed toward exploring new synthetic materials that impart greater extreme-pressure and oiliness properties to such oils.

3. There is a tendency for users of cutting fluids to ask for a non-corrosive cutting oil in both the cutting-fluid and lubrication systems of machine tools, especially automatics.

Table V—How Chlorine Affects Blended Oil When Threading SAE 1020 and SAE 3140

Item	Blend of Straight Mineral Oil and Sulphurized Fat	Blend of Straight Mineral Oil and Sulphurized Fat and Chloride
Viscosity, S.S U. at 100 F.	169	165
Sulphur, total %	1.49	0.61
Sulphurized fat, %	6	2
Chlorine, %	—	1.50
Tool Life, min.		
S.A.E. 1020	72	86
S.A.E. 3140	90	87
Finish		
S.A.E. 1020	Just Passable	Good
S.A.E. 3140	Good	Fair
Chaser wear, in. per chaser per min.		
S.A.E. 1020	0.6×10^{-3}	0.3×10^{-3}
S.A.E. 3140	1.5×10^{-3}	1.1×10^{-3}

Table VI—Results Obtained When Lard Oil, Sulphurized Fat and a Special Oiliness Agent Are Used When Threading SAE 1020

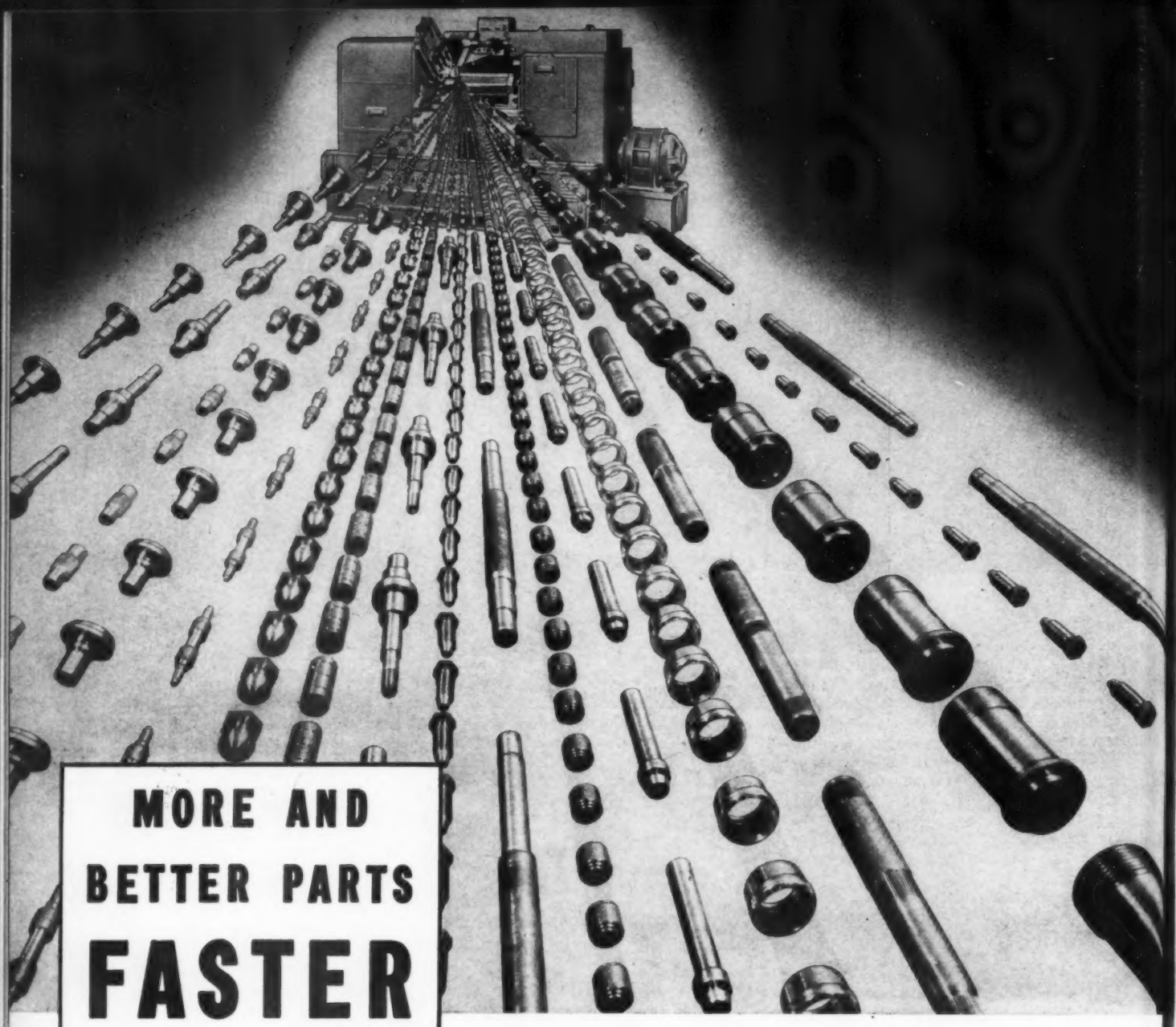
Item	Sulphurized Mineral Oil	Blend of Sulphurized Mineral Oil & Lard Oil	Blend of Sulphurized Mineral Oil & Sulphurized Fat	Blend of Sulphurized Mineral Oil & Special Oiliness Agent
Viscosity, S.S.U. at 100 F.	156	155	173	160
Sulphur, total %	3.16	2.50	4.30	3.0
Lard Oil, %	—	10	—	—
Sulphurized fat, %	—	—	6	—
Special Oiliness, Agent %	—	—	—	1.0
Color (A.S.T.M.)	4½ max.	4½ max.	Very dark red	4 max.
Odor	None	Lard Oil	Distinct Sulphur	None
Tool life, min.	55	64	79	75
Finish	Good	Fair	Very good	Very good
Chaser wear, in. per chaser per min.	0.5×10^{-3}	0.64×10^{-3}	0.3×10^{-3}	0.4×10^{-3}

Table VII—Chlorine Does Not Improve Cutting Oils When Tapping and Threading SAE 1020

Item	Blend of Sulphurized Mineral Oil and Special Oiliness Agent	Blend of Sulphurized Mineral Oil and Special Oiliness Agent and Chlorine
Viscosity, S.S.U. at 100 F.	155	160
Sulphur, total %	3.0	2.9
Chlorine, %	—	1.2
Tapping efficiency, %	99	102
Threading efficiency, %	102	103

Table VIII—Chlorine Improves Tool Life When Drilling NE 8640 (265 Brinell) at 75 sfpm.

Item	Blend of Sulphurized Mineral Oil and Special Oiliness Agent	Blend of Sulphurized Mineral Oil and Special Oiliness Agent and Chlorine
Viscosity, S.S.U. at 100 F.	155	160
Sulphur, total %	3.0	2.9
Chlorine, %	—	1.2
Tool life (number of holes drilled)	102	141
Falex wear test (Loss of weight of drills in mg.)	2.3	2.5



MORE AND BETTER PARTS FASTER

What interests the master mechanic and the process man when selecting automatics — the net good pieces at the end of the shift — that is the keynote in our highly competitive days ahead. In the manufacture of countless consumer items, the emphasis must be on maximum production with minimum down time.

By helping to step up production with maintenance of constant accuracy, New Britains are continually proving their value to their users. New Britains are engineered for long hard usage, high production, and fewer maintenance problems.

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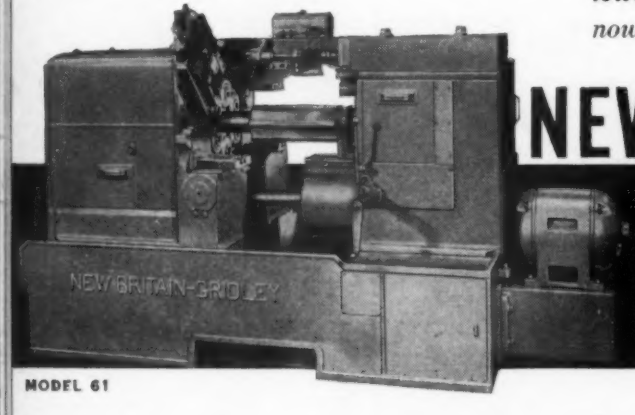
New Britain builds four and six spindle automatic screw machines up to 2¼" capacity... also a complete line of multiple spindle automatic chucking machines — four, six and eight spindles up to 12" capacity.



MODEL 61

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

NEWS OF METALWORKING

Steel Situation Worsened by Supply Uncertainties, Priorities and Labor

PITTSBURGH—If it could be definitely established that steel supply and demand will attain an approximate balance some time during the early part of 1947, it would have an important effect upon inventory policies during the next several months, it is conceded in the steel industry here.

However, these same interests say that both producer and consumer of steel alike are most acutely interested in current supply situations, which are tight in all important particulars. On the other hand, there may be supplies of special steels available and it is emphasized that removal of price controls of earlier this year and contemplated decontrols (tool steel) now give recognition to such situations.

There is no move contemplated to decontrol other finished steel products and these include the common varieties of carbon steel.

Priorities Cross-currents

A battle of words continues to exist between steel officials and Washington authorities over priorities. Steel men insist the volume of priorities and their method of issuance hamper production, create confusion within the industry and deny steel to important customers of the metal who cannot qualify for priorities. In recent days, the lack of sheet steel has been prominently mentioned in shutdowns in the automobile industry and shortages of steel have been blamed for 20% reduction in freight car manufacture in September.

Steel men say, in effect, steel involved in housing priorities should be spread out over a greater period since such steel covering the fourth quarter, for instance, cannot all be used when it becomes available. These same interests also claim that to permit efficient scheduling of output, priorities should be presented six weeks before steel is expected to be produced.

The difficulty over all, it is claimed, is not that sheets in priorities is such a great proportion of total steel made or, for that matter, in respect to total sheets made, but a better system of administration would prevent critical situations at the plants of non-rated consumers who could obtain their anticipated quotas with reliance.

Lower Steel Demand?

The difficulties in plants of non-rated consumers have been cumulative to such a degree that many of them are reported to be veering toward the drastic policy of a balanced inventory situation at their plants irrespective of its effect upon their factories' operations. If carried out, this can result in a reduced overall demand for steel, but observers in the trade do not anticipate the pressure for steel to diminish any time this year.

By and large, steel producers are refraining from opening their books for 1947 except on some contract items and special steels. Such action may be delayed until about November 15 when the mills will have some opportunity to estimate their obligations to be carried over from 1946.

Items such as tin plate will be deferred for other reasons. Tin plate books will be opened when the government's price policy on tin for next year is determined.

Uncertainties Spread

The long-range viewpoint on steel presents a paradox. A skittish attitude makes itself evident when a $20,000,000,000 decline in stock market values from the high of the year is contemplated. New labor contracts come up for renewal early in 1947, with the possibility of "outlandish" demands being made such as are presently responsible for the "it-can't-happen-here" electric power strike in Pittsburgh. On the other hand, the possibilities of labor disputes and material shortages combining to prevent a sufficient flow of finished goods which is the preventative of inflation are strongly present.

Light Steel Shipments Rise

NEW YORK—Light steel products, used mainly for the manufacture of consumer goods, received more steel shipments than in any first half year since 1939, according to the American Iron and Steel Institute. Total shipments of steel products in the first six months of 1946 were approximately 22,000,000 tons, of which 45.4% consisted of light products. During May, shipments of light products were actually higher than shipments of heavy products by a very small margin.

Electric Equipment Shortages Force Lay-offs at Twin Coach

BUFFALO — Material shortages forced the Twin Coach Co. to lay off 225 of its 875 workers for several weeks in mid-October to enable the company to build up supplies of electric switches, motors, wire, etc.

Ford Tractor Loading Device — Tractors are run up steel ramps under their own power, swung on a turntable at the top of the ramp, and run into the upper deck of waiting box cars, thus eliminating the installation of heavy overhead cranes. Fourteen tractors are loaded in each car, one of which is shown here.

Gaging Business

Material Race Slackens

The industrial race for materials is slackening down a bit and individual manufacturers are lowering their sights to closer relationships with actual experience. Scattered lay-offs and open admission of the abandonment of excessively high production goals are increasing, and many managements are taking more pains to level out inventories in line with the shortest material they require. As the production flow steps up, the slight reduction in manufacturers' inventories is being more than offset by larger inventories in the hands of distributors.

Involuntary inventory accumulations have resulted in numerous cases where manufacturers have been unable to move finished products due to the transportation shortage. For example, one maker of electric ranges has 1,500 units ready for shipment, but awaiting freight cars. Transportation bottlenecks are also holding up shipments of parts and materials with various production lines down until adequate supplies have been accumulated, another reason for increasing inventories at some plants despite efforts by most managements to control inventories.

The latest production scoreboard shows that makers of electric irons, vacuum cleaners, electric and gas ranges, washing machines, and trucks and buses were able to get enough materials to better their prewar output peaks. On the other hand, makers of refrigerators, passenger cars and sewing machines were not able to equal their prewar peaks largely due to material shortages.

The comparative showing of both groups is not merely evidence of relatively better ability to get a greater share of available materials than the other fellow, but also stems from the availability of the particular types and sizes of material required, as influenced by distorted OPA price ceilings, priorities and strikes.

Record Truck Output

Generally overlooked in the midst of pessimistic Detroit reports is the fact that truck production, totaling 97,881 units in August, was 8% above 1941 record monthly average of 91,000 units. Since 20% of the 1941 output represented military trucks, it is obvious that over 25% more trucks are being made available for civilian use than in any prewar average monthly showing. With the nation's transportation system in a critical situation and badly starved for new equipment, this development is a nice piece of good news for all industry.

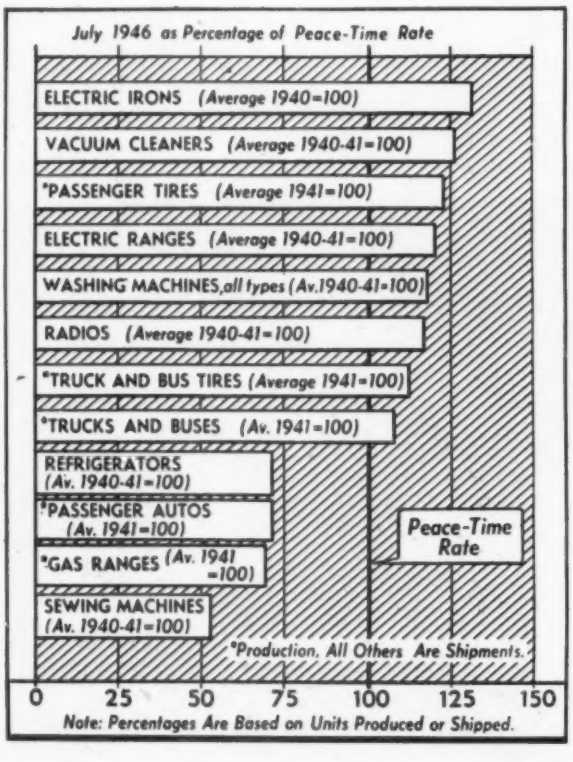
This paradoxical showing in the face of limping auto production is probably accounted for by the major limitation of sheet steel, larger quantities of which are required for automobiles.

Steel Flow Rising

Steel operations continue to hold at 90% of capacity, despite continuing doubts of the industry's ability to maintain this level. Moreover, finished steel output is now hitting an annual rate of 63,000,000 tons, close to wartime record levels. Even more significant is the fact that 25% of total shipments are in sheet and strip, items which have been in critically short supply. Production of sheet and strip is now at capacity levels of around 16,000,000 tons annually.

This performance comes at a time when most steel prognosticators are increasingly pointing out why steel operations can not hit the peaks now being maintained. Barring any strikes in coal or steel, it is likely that the steel industry will continue to make liars of pessimistic forecasters. Part of the reason for this has been the steady expansion of blast furnace operations, which already have lifted monthly pig iron production to the highest levels since May, 1945, thus going a long way toward making up for the steel scrap shortage.

Postponement of industrial expansion orders, cancellations of equipment orders, and reduced production goals on the part of many steel users makes the slight easing in demand come at a time when steel output is hitting peak peacetime levels. This condition strengthens the feeling that steel demand and supply will be in better balance early in 1947.


July 1946 as Percentage of Peace-Time Rate
ELECTRIC IRONS (Average 1940=100)
VACUUM CLEANERS (Average 1940-41=100)
*PASSENGER TIRES (Average 1941=100)
ELECTRIC RANGES (Average 1940-41=100)
WASHING MACHINES, all types (Av. 1940-41=100)
RADIOS (Average 1940-41=100)
*TRUCK AND BUS TIRES (Average 1941=100)
*TRUCKS AND BUSES (Av. 1941=100)
REFRIGERATORS (Av. 1940-41=100)
*PASSENGER AUTOS (Av. 1941=100)
*GAS RANGES (Av. 1941=100)
SEWING MACHINES (Av. 1940-41=100)
Peace-Time Rate
*Production, All Others Are Shipments.
0 25 50 75 100 125 150
Note: Percentages Are Based on Units Produced or Shipped.

Record Durable Goods Production — Despite shortages of various materials, quite a few industries have managed to exceed prewar peak levels of production as may be evidenced by this chart. In August, the production of gas ranges also exceeded the prewar peak

More Decontrols Due

Industry observers believe that price controls will come off machine tools before the end of the year. Reduced demand for new equipment, rising availability of surplus machines, and the industry's slowness in raising prices in line with recently granted boosts in ceilings, convince machine tool builders that price ceilings may be lifted entirely. This probably will not be accompanied by any immediate price increases by the industry, but will help make possible resumed production of some types and sizes of equipment now not produced due to unfavorable ceiling prices.

It is also reported that tool steel price ceilings may be lifted. But this is only a minor item, since the steel industry would like all controls off.

Increased Shipments, Selective Buying Levelling Off Inventories

CHICAGO—Now that Chicago area metalworking firms have settled back and taken a more realistic view of the future, a few rays of sunshine are penetrating the clouds. One is the increasing belief that OPA—at least as far as durable consumer goods are concerned—will be dead by the end of the year. Another is the gradual ending of the inventory logjam.

One large company reports that every $100,000 of material that is delivered to the company allows the finishing of $1,000,000 of stalled inventory into completed goods. The effect of this ratio in swollen and unbalanced inventories is rapid—and some companies say that their ratio of inventory cutting to deliveries is even greater than ten-to-one. Of course, the manufacturers are counting on two things: uninterrupted deliveries of parts and raw materials for a while, and an attempt by the manufacturers themselves to hold back buying so that the unbalanced condition does not persist.

The latter trend means that more companies are refusing to buy anything that is available, even though they already have large stocks of the item. In effect the result will be that some materials will enter a buyers rather than a sellers market.

Business Booming

Meanwhile general business reports in the Chicago region indicate that overall conditions are still on the upswing. The Chicago Association of Commerce's latest monthly report says that employment in the city is rising, and approximately equals the VJ-Day total. Manufacturing industries' payrolls are rising faster than the average. Industrial developments in September totaled $29,000,000, against $13,000,000 a year earlier. Expansions and additions include those of Electro-Motive, National Tube, Borg-Warner, Chicago Foundry, and Illinois Iron & Bolt.

Reports for the state as a whole showed that employment increased about on a par with Chicago, and also indicated that weekly earnings in manufacturing plants were continuing to edge up.

Truck Output High

While materials shortages continue to plague makers of trucks, they report that production is proceeding at a good rate. Four Wheel Drive, in its 1945-46 fiscal year, turned out almost eight times the volume of its best prewar year, and is now rated as one of the four largest independent truck makers in the nation. The company has been in continuous operation since the end of the war—a record few others can equal.

Harvester produced 1,200 fewer truck units in September than in August, but output is nevertheless fair when compared with prewar. In addition to the shortages of raw materials Harvester is also faced with a lack of heavy-duty transmissions and steering gears.

Truck Need Large

Truck makers expect their full output to be absorbed for a long time to come. Of the roughly 5,000,000 motor trucks registered, about half are said to be obsolete and due for replacement for economy reasons. While the industry hoped to turn out 1,500,000 trucks this year (or 50 per cent more than the prewar peak of 1,000,000 in 1941) materials shortages and strikes have made this goal unrealizeable.

P. V. Moulder, executive vice-president of Harvester, says that "most of the materials shortages we have faced and still face arise from a basic lack of sufficient steel production in this country to meet the immediate requirements of all the industries that use steel as a fundamental material in their product."

750,000 Unit Output

Even with enough steel, however, truck makers still lack production capacity to satisfy demand. In the first eight months of 1946 the industry turned out about 500,000 units, and output for the entire year is expected to reach 750,000 trucks—about half of the anticipated output.

Although 100,000 units were produced by the industry in August, leaders among truckmakers doubt that that level can be maintained for the balance of this year and even for most of next year.

WAA to Push Competitive Bids Where Fixed Prices Fail to Move Surplus

WASHINGTON—War Assets Administration has authorized regional directors to call for competitive bids immediately after fixed price offerings have failed to move goods. Machine tools and production equipment are not covered by the order.

Sealed bids and auction sales have been authorized all along, but have been little used. While bid sales are being jacked up, the fixed price method "can best be used to move merchandise in volume" to: (1) to satisfy small business and priority claimants; (2) to continue distribution through normal trade channels; and (3) to obtain maximum cash returns. Many priority claimants are prohibited by law from bidding.

Property already certified or identified as scrap will be pushed under the bid program, except where fixed pricing or other established practices conflict.

Whereas in the past sales have been held up pending offerings to preference buyers, regions are now authorized to call for bids and hold a reserve for priorities. Claimants must make known amount of intended purchases, at a "fair" price. Said price is established on the basis of offers by non-priority buyers.

POWER, HOTEL STRIKES CANCEL ASTE MEETING

DETROIT—The American Society of Tool Engineers Semi-Annual Convention to be held in Pittsburgh was cancelled because of the power, hotel, and other strikes in the big steel city. The Society will hold a limited meeting at the Fort Shelby Hotel, Detroit, Oct. 25-27, largely for its committees and it Board of Directors.

The next national ASTE meeting will be its Annual Convention to be held at Houston, Texas, in March, 1947, according to Harry Conrad, Executive Secretary.

Cleveland Automatic Acquires LeBlond Engineering Company

CLEVELAND — Stockholders of Cleveland Automatic Machine Co. have approved a merger of the LeBlond Engineering Co., Cincinnati, into their company with the business to be continued under the name of the former. No changes in management, personnel, or manufacturing policies were announced by Harold R. LeBlond, President. Mr. LeBlond has also been president of the LeBlond Engineering Co., since its start in 1940. Since the LeBlond unit has been wholly owned by the R. K. LeBlond Machine Tool Co., its merger with Cleveland Automatic gives the LeBlond interest an 84% stock ownership in the company. Cleveland Automatic has been making single and multiple spindle automatics for over half a century.

$350,000,000 of Surplus Tools Subject to New Pricing Program

WASHINGTON—A new pricing program for surplus machine tools was announced by the War Assets Administration on October 9th, to be applied to some $350,000,000 worth of government-owned tools. Under the new formula, the amount equal to the cost of rebuilding any machine over 2 years old will be deducted from the Clayton formula price. Fixed prices will be applied to all "slow sellers" on the basis of make, model, and size, in accordance with the new regulation 13.

Robert M. Littlejohn, WAA Administrator, said that the new prices would cover 60-70% of all surplus tools. The Clayton formula will continue to apply to prices of all other tools. A catalogue of prices is to be in the hands of all 33 regional offices of WAA and in the hands of approved dealers by the end of the month.

No provision for trade-ins is made in the new pricing set-up, and it is reported that no such provision will be made, since WAA wants to get out of the surplus machine tool business as soon as possible. But regional offices having "significant holding" of machine tools are to immediately offer for scrapping all stocks unsaleable for use in their present form.

The action by WAA followed closely criticism of the Clayton formula by the Surplus Property Subcommittee of the Senate Military Affairs Committee. One interesting aspect of the WAA's new pricing policy is that credit for it is given to William J. Kelly, president of the Machinery & Allied Products Institute.

Modern Weapons Demonstrated at Annual Army Ordnance Meeting

ABERDEEN—More than 5,000 members of Army Ordnance Association witnessed a demonstration of modern weapons at Aberdeen Proving Ground, Md., as a part of the organization's 28th annual meeting. Some 109 ordnance items were demonstrated during the day, ranging from the latest models of the Garand rifle to the 240-mm. howitzer and "Little David," the 914-mm. (36-in.) mortar developed for the seige of the Siegfried Line.

Initiating the program was a playback of a doppler record of the flight of a V-2. This is one of nine successful tracking systems in use by Army Ordnance; it records trajectory, velocity, acceleration and altitude at any range. Some 24 self-propelled weapons and tanks then approached the stands en masse, firing as they came.

Cargo-Tractor-Truck

Among new prime movers shown was the 2½-ton, 4 x 4 T23 truck, which has large ground clearance, 18.00 x 26 single tires and can ford water 65 in. deep. Another was the 8-ton, 6 x 6 T28, which also serves as a cargo truck and a truck-tractor. The rear bogie has a chain drive. The T30, a variation, has a gear-driven rear bogie. Another is the tracklaying M8 cargo carrier, which can carry 10,000 lb. of ammunition and tow a gun as well. There was also the armored utility vehicle M44 which carries 24 fully equipped infantrymen under light armor.

Several tank recovery units were shown, among them the M25 40-ton "Dragon Wagon" which will pick up a medium tank, the 12-ton T26, 8 x 8 which has front bogie steering, chain-drive rear bogie, and 8-wheel drive.

Tank Developments

Still under development is the T32 heavy tank, with a high-velocity 90-mm. gun and heavy frontal armor. It has a Ford V12 engine, a new transmission which permits graduated as well as pivot turns, and is steered by a "joy stick" like an airplane. The T28, our super-heavy tank, weighs almost 100 tons and mounts a 105-mm. gun. It was intended for cracking the West Wall, so is armored for close-range assault.

Three modifications of the 76-mm. gun carriage M18 have been developed for amphibious work. The T86-E1 has permanent float tanks, a deep hull, and twin propellers supplementing the tracks for water propulsion. The M19 swimming device for a medium tank has front and rear tanks or floats which can be jettisoned by firing 37-mm. blanks which eject the locking pins.

A 75-mm. automatic gun, the T9E1, can fire 15 rounds of shell automatically, is designed for installation in aircraft.

Added to familiar mortars now are 155-mm. and 240-mm. units, the latter designed for smashing heavy fortifications. Designed to help foot soldiers are 57-mm., 75-mm. and 105-mm. recoiless rifles. All can be carried in parts by hand.

The familiar "Bazooka" has been supplemented by a 3.5-in. M20 rocket launcher.

Outstanding among antiaircraft weapons is a 120-mm. gun, heaviest in service, which can fire against aircraft at 40,000 ft. or more. Heaviest mobile weapons are the 8-in. and 240-mm., which combine long range, accuracy, and projectile weight with great mobility.

Auto Industry Technicians and Researchers Are Being Laid Off

DETROIT—Evidences of readjustment of hopes to realities are coming to light in a few large Detroit plants. Skilled personnel is being reduced.

A general curtailment is in process among technicians, researchers and scientists of General Motors Corp. Basically, this stems from the decision to postpone indefinitely the construction of the new technical center for which building plans were announced earlier in the year. The postponement grew out of unavailability of construction materials.

When plans for this technical center were first set into motion, all company divisions began to acquire more technical personnel than they had previously had, with the idea of utilizing them in the center. Abandonment of the center means that these new people are superfluous for at least a year.

Their severance from the company payrolls, accordingly, became the next step. In addition, some other scattered projects throughout G.M. have likewise been trimmed back to size commensurate with the limited output potential of the next year or so, resulting in some further layoffs.

Ford Enlarges Staff

None of the other automobile companies appears to be in comparable situation. Ford, as a matter of fact, is still adding to its technical staff, in line with plans for its own technical center, which is still scheduled for early building.

Discontinuance of the light car programs in G.M. and Ford have had little effect on the development people working on them.

At Bendix Aviation Corp., meanwhile, all work has been completely shelved on the small personal aircraft which has been in development for the past year or more. The size of the retail market was the evident reason for this abandonment. All people in the laboratory have been reportedly let out, and the lab is being closed.

Detroit Letter

Sheet Steel Shortage

One thing after another casts gloom over the automobile community: this time steel and labor are throwing longer shadows. If the materials situation were to be described in turf terms, sheet steel has now taken a nose lead over copper and lead in the scarcity race, and seems to be slowly but steadily extending its advantage. As for labor, the situation caused by the union's wage demand on Chrysler offers little to cheer about.

The riddle of the moment is where steel is going. One of the topmost executives of one of the topmost companies had a fair answer this month. Nearly every company, he noted, expanded during the war, and wants more steel to operate with. Hardship cases can get CPA allocations, which serve to divide the remainder more thinly. Beyond that, tonnage at the mills is inadequate.

The upshot is that good steel industry sources figure that next year the car companies can produce an absolute maximum of 4,000,000 passenger cars and 750,000 trucks. Any installation of a full priorities system, as is being gossipped a possibility, would reduce that projection; in fact anything would. Auto men, particularly some in G.M., believe these figures too low, but their viewpoints may be born more of hope than statistical fact.

Chrysler has joined Hudson among the companies in current difficulties due to lack of sheets. Chrysler operations sloped off sharply as the month advanced; Hudson had already gone through a 1-week shutdown.

Chrysler Strike Likely

Labor sources were openly dubious of Chrysler's curtailment. They believed it to be much more a part of the pattern leading up to negotiations over new union wage demands than an effect of materials shortages. Their accusations, however, only indicate that the Chrysler move is awkward for them, occurring as it did just before negotiations over new wage demands were to begin.

Detroit is pessimistic about the outcome of these demands. As sideliners see it, Chrysler will decline the initial proposals of the union, and eventually—thought likely not at once—a strike will take place. Whatever settlement is eventually reached will provide a pattern for other auto labor cases, starting up the whole dreary cycle once again, an echo to 1945-46.

Absenteeism Serious

C. E. Wilson, president of General Motors, said recently that absenteeism in company plants averaged 4.7% during September, about triple the prewar level and probably nearly double the proportion as recently as last spring. Other automobile company figures are notably higher, so much so that the industry average probably is close to 6%.

As for turnover, checkup of leading plants indicates an industry rate today around 5% per month. This, too, is much above prewar averages.

An interesting thing about both these records is the wide variance between companies; and further, the lack of correlation between absenteeism and turnover. Methods of tabulation may play some part in this, but not much. The only broad conclusion which is being drawn is that there is less interest in holding jobs than in the past, and that as long as jobs are as plentiful as at present, indifference will continue, and make labor relations problems harder.

Willys Looking Up

Down at Willys-Overland, in Toledo, more optimism pervades the air. The reason is a new line of passenger cars, one model of which drew much favorable commendation when it was shown early this month.

The car, a 2-door sedan, has much to recommend it. Wheels are individually sprung over a 104-in. wheelbase; the 6-cylinder powerplant will be brand new; design is interesting and effectively done. Hopes are to swell output of this vehicle to 25,000 units per month but a start will not be made until next May. At the same time, output will be running at 300 per day on jeeps, and volume on a new station wagon is slanting upward from a current 75 a day or thereabouts to a goal of 300 daily.

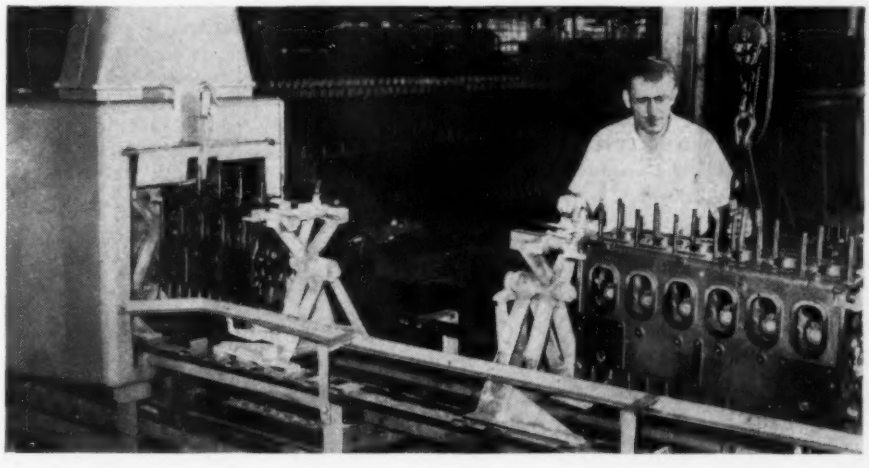
To reach its production objectives, Willys is modernizing its plant wherever necessary. The largest single unit of development is a new 67,000 ft. press shop, which will house 72 presses ranging from 50 to 1,400 ton capacity. Expenditure of $1,600,000 for the presses and some $3,000,000 to tool them is anticipated.

Tucker's Progress

The auto industry's latest formal competitor is the Tucker Corp., about which much has been written and said. Tucker, through admittedly remarkable legerdemain, got the War Assets Administration to lease it the huge Dodge-Chicago plant, mostly on the basis of the employment (35,000 people) it expected to have. Then, having obtained a basis for financing, it started out to obtain the money to operate the plant. Its next and perhaps hardest hurdle will be the obtaining of materials to build the glamorous Tucker Torpedoes.

ALUMINUM WIRE

NEW YORK—Aluminum is being substituted for copper in building wire and cable now being produced by United States Rubber Company, because of the current copper shortage. The insulated aluminum wire will be made in all sizes, as approved by Underwriters' Laboratories. It has been developed with the same overall diameter as equivalent copper wire sizes.



Washing Diesel Engine Blocks—Foreign matter is being cleaned out of General Motors diesel engine blocks in this photo. The blocks are cleaned in another automatic washer through which the blocks move horizontally and rock back and forth on cradles, thus cleaning all areas and getting rid of all foreign matter

U.S. Real Income May Double in 25 Years, Hoffman Tells A.M.A. Meeting

BOSTON — A prediction that the U. S. will see "unparalleled progress" during the next 25 years and a doubling of real income was made by Paul Hoffman, president of Studebaker Corp. and chairman of C.E.D., before a two-day Industrial Relations Conference of the American Management Assn. But he warned the 12000 industry executives and union officials present that this prediction would not be realized "unless we draw more heavily upon our capacity for working and thinking."

Mr. Hoffman stated that the wave of strikes since V-J Day would not have occurred if industry and labor had tried to "fight" for industrial peace, rather than resorting to force. He said that new laws and policies are needed to encourage industrial peace. Mr. Hoffman was awarded the Henry Laurence Gantt Memorial Gold Medal, given annually by the A.M.A. for distinguished achievement in industrial management as a service to the community.

Living Standard Peril

F. D. Newbury, vice-president, Westinghouse Electric Corp., said that unless efficiency and production are increased, lower living standards are inevitable. He declared that American standards depend on rising per capita production and declining unit labor costs and prices for manufactured products. Yet, costs have been rising faster than productivity, lifting the break-even point of many industries and making them more vulnerable in mild recessions.

Martin Dodge, of Dodge and Mugridge, New York public relations counsel, criticized industry for failing to get its message across to its employees. He said that industry "seems to be in doubt as to what its message is." He pointed out that among facts that should be told are that profits are 4% of the sales dollar, and that the ratio of wages to salaries is 87% to 13% and not the reverse, as some employees believe. He added that management's good behaviour should accompany good literary material.

Cost Savings Shared

David W. Rust, vice-president, Bundy Tubing Co., explained a plan for sharing cost savings with employees that has lifted plant efficiency 60% and has the approval of the CIO United Auto Workers. The plan provides for an equal sharing by company and employees of a fixed percentage of sales value of finished goods over the "standard" agreed upon by the company and the union. During the first three months, the plan yielded $118.27 in extra earnings for those who worked the full period. This has dropped absenteeism 35.5%.

In describing labor-management relations, James Farmer (CIO), Seattle, said that mutual suspicion between labor and management prevents good labor relations. Roberic Olzendam of Tacoma, suggested that employees should be considered as equals with responsibilities for about $6,000 worth of equipment apiece, and constituting the major element of cost (65-80% per dollar of income).

Annual Wage Plans

A. T. Court of General Motors stated that the four elements of annual wage plans are: (1) amount of work must be stable; (2) available work must be shared by regular employees, with another group accepting variable employment; (3) to help the individual spread his income over the year resort should to made to such mediums as a standard wage despite variable hours, an employee savings fund as a reserve for slack periods, or an employee loan setup; (4) some method of payment for idle time. Most union plans feature the fourth provision.

In examining the guaranteed annual wage, Professor J. L. Snider, of the Harvard Graduate School, said that these factors should be considered: past irregular employment; minimum historical labor requirements; effects of increased fixed costs; effects of a wage guarantee on stabilizing the business; product characteristics favoring wage guarantees; prospective labor-saving developments; company growth prospects; possibilities of release from overtime premiums through a guarantee; transferability of workers. He favors guarantee of at least 60% full-time work, assuming a favorable unemployment compensation law exists.

Army Air Forces Plans Reserve Of 12,500 Prime Machine Tools

WRIGHT FIELD, O. — The Army Air Force has authorized an emergency reserve of 12,500 machine tools to be stored under continuous maintenance. Air Materiel Command Headquarters personnel are now selecting prime grade tools for storage. It is estimated that AAF demands for machine tools in the first year of any emergency would approximate $300,000,000.

Doubled Plastic Production Forecast For Each Next 5 Years

NEW YORK—So great has been the growth of the plastics industry that its demands are three times as great as the capacity of the plastics materials manufacturers according to William Lester of the Celanese Plastics Corp., speaking before the New York chapter of the American Society of Tool Engineers recently. From a prewar capacity of 100,000,000 lb. of molding powder the materials manufacturers will have attained a production of 500,000,000 lb. by January of 1947.

Mr. Lester quoted the well known authority, Dr. Gaston Dubois, as saying that the industry will double its productive capacity every year for the next five years at least. The speaker also stated that at least $125,000,000 will be spent in 1947 to increase plant equipment.

Number of Machines Doubled

Injection molding machines will have increased from 1450 in 1944 to about 3400 by the start of the year. Due to the trend to larger size injection machines the rated ounce capacity of the injection molding industry will have doubled by that time. Top capacity of injection molding machines, which rested at about 26 ounces for a number of years has now reached 80 ounces and will shortly utilize machines rated at 100 ounces for the auto industry.

Extrusion machines will have jumped from 640 units in 1944 to at least 1100 by January and compression presses will rise from 11,500 to 12,800 by the start of the year. The average machine operating hours will also have increased 50%.

There are about 25 firms producing plastic materials today. Custom molders, which do not include plastics divisions of metalworking plants, number about 650, fabricators about 1500 while laminators number about 40 at the present time.

Mr. Lester indicated that in the further expansion of the industry great dependence will be placed on tool and die makers, machine tool engineers and designers. Significant, too, is the interest displayed by the metalworking industry, through its many branches, in this development of the plastics industry.

Following Mr. Lester on the all-plastics program were James Wilson, of Watson Stillman Company, who spoke on "Commercial Equipment used in the Manufacture of Plastic Articles" and Islyn Thomas of Thomas Manufacturing speaking on "Tooling for Plastics, Mold Design and Methods used to Fabricate Molds for Quality Reproductions."

Washington Bulletin

New Commerce Secretary

Sworn in as successor of Henry Wallace as Secretary of Commerce, W. A. Harriman indifferently impressed his first press conference with generalities on his faith in American industry to work out its problems. Taking a statesmanlike stand he said he had been hired to work for all the people, and that he would act as spokesman for business when the business point of view is in the public interest.

Harriman was many years chairman of the board of Union Pacific; is a combination business man and liberal; is friendly toward the Soviets and so regarded by them; is generally accepted as a good appointment for these times.

Harriman finds himself immediately in a squeeze between Commerce and the railroads. Henry Wallace, just before the President fired him, recommended that the Interstate Commerce Commission withhold for a few months its decision on the rails' application for a 25% freight rate increase. Wallace said that the railroads had based their claims on poor traffic on the strike-bound first quarter of 1946, but on current costs; that the resultant picture was misleading; that new data should be obtained. The new Secretary said, when asked the question, that the rail rate matter was for Commerce a closed book. Chances are that he cannot open it without prejudice to his position, even if he wants to.

October Surplus Sales

Metalworking machinery, iron and steel, non-ferrous metals, aircraft and components are among surplus goods to be sold by War Assets Administration at 651 sales in October, including 172 site sales—total well over $1 billion. There will be 27 site sales of metal working equipment: 1 at Birmingham, 3 at Cincinnati, 1 at Houston, 4 at Los Angeles, 10 at New York, 2 at Philadelphia, 3 at St. Louis, 2 at Salt Lake, 1 at Tulsa. Iron and steel, Birmingham 1, Dallas 1, Los Angeles 2, New York 3, Philadelphia 1. Non-ferrous metals, Birmingham 1, Dallas 1, Los Angeles 2, New York 4, Philadelphia 2. Other categories of goods, to be site-sold at various places: motor vehicles, machinery, hardware, industrial machinery, special industrial equipment, materials and supplies. Metalworking machinery and equipment offered at sales in 1946 is estimated at $123,517,000; iron and steel, $14,237,000; non-ferrous metals, $6,152,000.

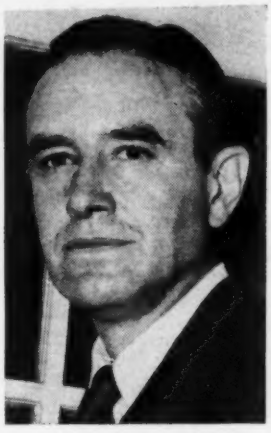
Tools for Schools

Under instructions from John R. Steelman, reconversion director, through Civilian Production Administration, the War Assets Administration has set up another of its several programs donating surplus equipment to educational institutions. This one isn't quite a give-away: equipment is offered at 5% of cost, plus shipping charges, to schools training GIs under the bill of rights. With the 95% markdown goes also top priority. Included among 11 broad categories of equipment offered is metalworking machinery. This move is inspired by (1) emergency need for equipment in schools which released much of it for war, and (2) over-all hurry-up to clear out all surplus property.

Galvanized Sheet Subsidy

Word is circulating in the Capital that Wilson Wyatt, aggressive housing administrator, is urging a subsidy bonus on production of galvanized iron, payable to producers who exceed their high month's output this year. Galvanized sheet is badly needed for house construction. Pressure is on for a price hike in zinc, for more production to balance off withdrawals from Metals Reserve, whose stocks will be out in two or three months at the present rate, threatening a predicament in case of more mine strikes. An interesting angle is that substantial price boost would put high grade die casting zinc in reach of competition by aluminum.

New Commerce Secretary



W. Averell Harriman

Lead Priorities

Through the war and up to now the government has doled out materials with emphasis on maintenance of civilian equipment in use. Turning point in favor of assistance in new production is marked by CPA preference for lead allocated to storage baterries in 4th quarter 1946. This preference is made possible through 20% reduction in allowable lead for replacement batteries, plus expectation of moderate increase in production and imports. CPA said "tickets" worth 232,500 tons of lead in 3rd quarter were only "hunting licenses," because consumers got only 182,000 tons.

Jet Propulsion in Auto Plant—A row of Derwent V jet propulsion engines are being assembled by workmen in this new engine assembly shop at Rolls Royce's Derby Works in Britain. The engine, in a Gloster Meteor, recently held the world's speed record at 606 m.p.h.

Mass Production Responsible For Increased Cutting Oil Research

BOSTON—Growth of the automotive industry, demand for tougher steels, need for interchangeable parts and finer finish, and the increased speeds and feeds of mass production practice, have accelerated development of our modern cutting fluids, according to James T. Beard, Jr., Staff Engineer of Socony-Vacuum Oil Company, Inc., speaking before the semi-annual meeting of the American Society of Mechanical Engineers.

These conditions were met by cutting fluids which contained sulphur, sulphurized fats, chlorine and other chemicals. Such additives have made it possible for cutting fluids to function under heavier loads without excessive heat and with correspondingly longer tool life, closer tolererances and better finish.

When these materials were introduced, little was known of the limits of their behavior. It was not until about 1935 that more careful study of the action of cutting fluids began to throw some light on the functions of various ingredients. In these studies certain machine tool builders, manufacturers of steel and other investigators took an equally active role with the marketeers of cutting fluids.

One of the mistakes in earlier cutting fluid research was that too much reliance was placed on chemical analyses and total content of such ingredients as sulphur. What was needed for practical purposes was an evaluation of the inactive natural sulphur present in the mineral oil itself, the very active sulphur that was added in the sulphurizing process and the less active sulphur that was present when a sulphurized fat had been incorporated in the blend.

DEVELOP CHLORINATED OILS

Tests conducted with this criteria in mind indicated that machining of clean-cutting steels is done most efficiently without too much active sulphur and with a considerable amount of extreme-pressure characteristics. A blend of straight mineral oil and sulphurized fat met these requirements and for most high-Brinell steels, cold-drawn low-carbon steels, free-cutting manganese steels and high-sulphur screw stock.

The moderately active sulphur in sulphurized fat is sufficient to prevent the built-up edge from actually welding to the tool, yet not active enough to leave the cutting edge entirely unprotected. However, where hot-rolled, low-carbon steels and most medium-carbon steels are concerned machining is more satisfactory with a high percentage of active sulphur.

One of the most important steps in the development of cutting fluids was the addition of chlorinated material. When carbon tetrachloride was applied to machining of aluminum, microscopic deposits large enough to prevent actual metallic contact were evident. The Eastern Machine Screw Company, for instance, used carbon tetrachloride as a standard by which they evaluate the effectiveness of various commercial cutting fluids in the threading of Type 305 stainless steel.

Reasons advanced for the effectiveness of chlorine in machining operations are:

First: it provides high film-strength.

Second: it becomes chemically active at lower temperatures than sulphur, as borne out by low-speed threading operations.

Third: it seems to activate the sulphur.

Unfortunately, carbon tetrachloride is not available for use in cutting fluids. It is toxic, volatile, expensive and must be replaced frequently.

However, other non-toxic chlorinated materials have been made available and when added to a blend of straight mineral oil and sulphurized fat they improve its performance in threading hot rolled SAE 1020 steel. However the reverse is true when threading hardened SAE 3140 steel.

Although still open to discussion it was stated that effectiveness of chlorine in threading operations seems to be questionable, where life and wear of tools is considered with thread finish. Tests do indicate, however, that chlorine is beneficial where tools are subjected to a continuous and heavy in-feed such as drilling, reaming, forming, grooving and cutting off.

OILINESS AGENTS

Oiliness agents such as lard oil and sperm oil have been commonly used in cutting fluids although they have no special pressure-resisting properties and little resistance to the rubbing action of a chip on the cutting face of a tool. Only the sulphide films, produced when a sulphurized mineral oil is used, can resist the tremendous rubbing forces.

On the other hand the merely oily films do give a considerable measure of protection to the so-called boundary area of a tool, where wear during the machining of clean-cutting metals is at a maximum.

When blended with a mineral oil containing the optimum amount of active sulphur, lard oil or sperm oil provides a cutting fluid that protects not only the extreme-pressure area of a cutting tool but also the boundary area. Sulphurized fats have also been used as oiliness agents and have good extreme pressure properties. Blended with sulphurized mineral oils, they have been more effective in machining operations than corresponding lard-oil blends. The most effective oiliness agents are those synthetic materials which have been developed during the past two or three years. Their outstanding characteristic is their light

CUTTING OIL TRENDS

1. Greater use of light-colored, transparent, odorless cutting oils—both corrosive and non-corrosive.
2. Increased testing of new synthetic materials that impart properties of extreme pressure and oiliness to light colored oils.
3. Increased use of soluble oils and compounds, especially in machining.
4. Sealing the cutting-fluid and lubrication systems of machine tools so that soluble oils and compounds can be used for cutting operations.
5. Increased demand for a non-corrosive cutting oil in both cutting-fluid and lubrication systems, particularly in automatics where leakage is encountered. Tool builders in general seem reluctant to approve this practice.
6. Maintenance of uniform cutting-oil temperatures by refrigeration equipment, particularly for precision grinding.
7. Concerted efforts to evaluate the range of service and limitations of the new non-petroleum soluble compounds.
8. Greater interest in the factors that affect machineability of metals and particularly those physical, mechanical and metallurgical factors that influence selection of suitable cutting fluids.

color and absence of objectionable odor. Blended with sulphurized mineral oil their performance is equal to that of the sulphurized fat blends.

SOLUBLE OILS, COMPOUNDS

Conventional soluble oils, composed of straight mineral oils and emulsifying agents have practically no extreme pressure or lubricity properties and when emulsified with water serve chiefly as coolants. Heavy duty soluble oils contain extreme pressure ingredients, oiliness additives or both. When emulsified with water they perform some of the functions of a non-soluble cutting oil, although not to so marked a degree.

In their early development the chief problems in use of these emulsions were:

a—Emulsification with all kinds of hard water.
b—Rusting of the machined or ground parts.
c—Gumming of the machines.
d—Loading of grinding wheels.
e—Development of rancidity in the emulsions.
f—Development of offensive odor.
g—Instability of the unemulsified oil in storage.

The soluble oils now available are practically free of these early objections. Proper adjustment of formulas has facilitated emulsification in hard water; inhibitors have eliminated rusting of machined parts; gumming of machines and loading of wheels has been controlled by use of proper emulsifiers and water conditioners; germicides have eliminated rancidity and offensive odors and stability has been effected by controlled manufacturing procedure.

DEVELOP SOLUBLE COMPOUNDS

Recently, new soluble compounds have been developed which comprise water solutions of lubricity materials, rust inhibitors and germicides that mix with additional quantities of water more readily than soluble pastes and just as readily as the available soluble oils.

Field reports indicate that the service of these newer compounds is more limited than that of soluble oils although they seem to keep the machines and wheels cleaner. There is a trend toward the further evaluation of this type of product in the future.

Because of the lower cost of emulsions of soluble oil and compounds, as compared with non-soluble cutting oils, there has been a distinct trend towards the use of these cheaper coolants. This trend, however, has been hampered by two things.

First, the design of certain machines, particularly automatic screw machines, is such that there is frequently leakage between the cutting fluid and lubrication systems. As a result the use of soluble oil emulsions in automatics is not approved by many tool builders. Recognizing the desire to use soluble oils, a few builders have supplied effective seals and made it possible to keep the two systems separate and independent.

Even the heavy duty soluble oils are not adequate where a good finish is required on very draggy metals, such as hot-rolled SAE 1020, low-carbon nickel steels and many of the stainless steels. Nor are they adequate for those operations where exceptional finish and closer tolerances must be maintained.

In spite of this trend towards the use of soluble oils and compounds a survey made several years ago showed that consumption of soluble oils and compounds for machining operations did not exceed more than 20 to 25% of the total consumption of cutting fluids.

Results of specific tests run on cutting oil formulations are outlined in detail in the Reference Book Sheets on p. 137—139.

Fred S. Weatherby

Fred S. Weatherby, 69, New England manager for AMERICAN MACHINIST and PRODUCT ENGINEERING, died suddenly of a heart attack in New York City early in the morning of Oct. 3. Born the year AMERICAN MACHINIST was founded, he had been a member of its advertising sales staff for almost 46 years.

Mr. Weatherby became at 18 the advertising manager of J. A. Fay & Egan Company, Cincinnati, placing advertising in some 90 publications. He left the company three years later to represent the ST. LOUIS LUMBERMAN and THE AGE OF STEEL in the territory west of Pittsburgh. A year later, John A. Hill, then owner of AMERICAN MACHINIST, hired him to cover the territory from Pittsburgh to St. Louis. In his first year, he pioneered the selling of full-page and double-page space (for which the magazine previously had no rates) so successfully that he was transferred to New England, with headquarters in Boston.

In the years between Fred Weatherby has become a legend. He early established, and since has maintained, the highest space-selling record in McGraw-Hill, and has been personally responsible for the nationwide acceptance obtained by many New England companies through his continuing wise counsel in their advertising policies. His straightforward approach, terse and convincing arguments and his consideration for the time of those upon whom he called rapidly built him a wide circle of friends.

When a Boston office was established for McGraw-Hill in 1929, Mr. Weatherby was made New England Manager, and in addition he has handled the sale of advertising for PRODUCT ENGINEERING since the establishment of that publication in 1930.

In intensive territorial coverage, he established a record that has never been equalled, rolling up 25,000 miles a year regardless of weather or economic conditions, maintaining his seasoned counsel to clients and setting a stimulating example to his associates.

Mr. Weatherby's hobbies centered around his work, with travel his major pleasure during vacations. He was an expert on bridge, detective stories, and movies on New England food, a genial host and a firm friend.

He is survived by his wife, the former Mary Leaming, and three children, Allen L., owner of a Los Angeles bookselling house, Mrs. Charles (Evelyn) Vallender of Wellesley, Mass., and Philip Grandin, now in the New England territory for AMERICAN MACHINIST and PRODUCT ENGINEERING.

Productivity, Exports, Controls Highlight N.M.T.B.A. Discussions

QUEBEC—Many problems confronting the machine tool industry — shortages of materials, foreign trade, greater productivity, relationship with government, price control, finances and public relations—were discussed at the forty-fifth annual meeting of the National Machine Tool Builders' Association at the Chateau Frontenac October 7-9. An address by M. Grattan O'Leary, associate editor of The Ottawa Journal, was one of the highlights of the meeting, which was the largest in the association's history.

Our job today is to hold to and preach the philosophy of steadily increasing productivity, declared William P. Kirk, vice president Pratt & Whitney, Division Niles-Bement-Pond Co., in his address as president of the association. He predicted that "we are doomed to economic insolvency if we surrender to demagogic political and labor leadership the part that industrial leadership should take in a properly-balanced system of free enterprise." He pointed out that reconversion is the job of every man, woman and child in America. He asked what gain there is to the manufacturer in buying new machine tools unless men will produce more per hour on those machines. "We know that steadily increasing productivity is the one sure road toward low prices, high wages, steady employment and an increase in the standard of living," said Mr. Kirk.

Blame for Nation's Ills

Most of the blame for the lack of greater progress in reconversion observed Mr. Kirk, belongs on the doorstep of government and leaders of organized labor. Everybody has been trying to get out of doing the hard work that has to be done to get the country back on a real production basis. If union leaders had been sincerely interested in the welfare of their members, they would have got behind a drive for maximum productivity instead of doing the opposite. When a union insists upon higher wages and at the same time strives to limit productivity, that union is in the long run working against the welfare of its own members. Until we can get a fair measure of productivity, predicted Mr. Kirk, prices will continue to go up in proportion to wages, or even more.

Concentration on Washington should be the most important project of the association in the months ahead, in the opinion of James Y. Scott, president Van Norman Co. and chairman of the association's government relations committee. In self-defense the industry must assist in the formation of policy concerning it, he said. It is difficult to secure a reversal of policy once the government has adopted it.

Surplus Tool Declarations

It is believed that over 90% of machine tools to be declared surplus have already been declared, Mr. Scott reported. About 26.8% of the total machines thus far going into surplus have been sold, buyers paying 48% of the original cost. That is a very high percentage of return, compared with other types of surplus. WAA, despite red tape, confusion and delay, is selling as many used machine tools as the industry is selling new tools. Contract dealers have sold 35% of the total sold.

Though some WAA executives have decided that machines in long supply will be cut 70-80% below the original cost to move them, no such regulation has been issued, declared Mr. Scott. The industry has been assured that it will be consulted before that is done. The big fact is that simply cutting prices will not move a perceptible number of these machines. Instead it will open the door to speculators.

Scott Asks School Aid

Mr. Scott made a plea for schools to get free of charge the machines in long supply which they could use. He advocated retention by the government of special machines, such as shell tappers and shell case presses, instead of scrapping them as

Newly-elected President

HERBERT H. PEASE

Newly Elected Officers of National Machine Tool Builders Assn.

1st Vice President

A. G. BRYANT

2nd Vice President

L. D. McDONALD

Treasurer & Director

LOUIS POLK

Director

H. S. TIGGES

is now permitted under government regulations. Though no funds are at hand for the armed services to buy reserve surplus machines from RFC or WAA, a loan arrangement is being worked out so that the services can pay for them if and when they can get appropriations. Mr. Scott said that "the entire reserve of all the armed services, not including machines installed in arsenals and yards, is probably less than one month's output of the industry at wartime peak."

The foreign sales committee of the association, asserted Mr. Scott, has persuaded the Department of Commerce to set up an advisory committee of machine tool and press builders to cooperate with the Treasury, State and Commerce departments to decide ways of breaking down obstacles to increased sales abroad and establishment of banking arrangements that will enable machine tool companies, without undue risk, to give longer terms of payment to foreign buyers.

Cost Reduction Important

From now on cost reduction, combined with new and more vigorous selling methods, should be the foremost thought in the mind of every machine tool builder, remarked Frederick S. Blackall, Jr., president Taft-Peirce Mfg. Co. and chairman of the association's committee on fiscal problems. For years emphasis has been on production at any cost, he said, but henceforth we must attack costs resolutely. OPA may permit us to set our prices by adding a prewar rate of profit to present manufacturing costs, but that is no way to manage a machine tool business.

Mr. Blackall urged every member to appeal to Congress to deal realistically with the problem of more liberal treatment of depreciation under the tax laws. He suggested that if 1946 should be a good year for machine tool companies, they should make liberal disbursements to stockholders or be prepared to justify beyond question that net additions to surplus are "reasonable" within the framework of the present law. Mr. Blackall gave high praise to the newly-organized Tool Owners' Union founded by Allen W. Rucker of Lexington, Mass.

Europe Needs Tools

If free enterprise and democracy are to survive in western Europe they must be helped out of their economic paralysis, said Nelson F. Caldwell, export manager Cincinnati Milling Machine Co. Common to all countries is the need for more machine tools, and particularly the heavier types formerly supplied by Germany. American industry is in a class by itself in the eyes of Europeans and by the same token U. S. machine tools will get prejudiced consideration, said Mr. Caldwell. However, Americans should not forget that competing for markets which once were Germany's are Britain, Czechoslovakia, Switzerland, Sweden, Belgium, France, and Italy plus our own surpluses.

Switzerland and Sweden are the only two European nations with some semblance of stability and order observed Mr. Caldwell. The larger industries there have one, two or three years of unfilled orders. Wages are at a high level throughout Europe, averaging five times the prewar level. The focus of interest more than ever is on labor-saving equipment if prices are to be held within a competitive range.

Keller Analyzes Demand

Tools of simple design, top-quality tools of special design and high-production machines have the best chances of being sold abroad, said Alexander S. Keller, vice president Pratt & Whitney and chairman of the association's committee on foreign sales. There is a need for relaxation of our credit terms, with some acceptance of business on an open-account basis, as the British do. European buyers are more willing than ever before, said Mr. Keller, to judge machines on their productivity rather than merely on price.

As a result of a questionnaire sent to European dealers by Mr. Keller's committee, it was found that the appetite for U.S. machines is considerable. Average labor rate over there is 40c. to 70c. an hour, and higher rates are expected. Mr. Keller commented on the surprising growth of the Italian machine tool industry, which now numbers 50 builders. The demand for machine tools in many industries in Europe exceeds overwhelmingly the ability of the countries to provide it. Only $700,000 of the $5,000,000 to be spent here for machine tools by France, for instance, is for the automotive industry, which could use $90,000,000 worth.

Russians Looted Manchuria

At Mukden in Manchuria the Russians took 3500 out of the 10,000 machine tools installed, said A. B. Einig, general manager Motch & Merryweather Machinery Co., who was a member of the Pauley reparations commission which recently visited Japan, Korea and Manchuria (American Machinist, Sept. 12, 1946, p. 156-157). At another arsenal they removed 1300 good tools, leaving behind 300 in poor condition. The Russians knew exactly what they wanted and took it. They removed steam and hydraulic power plants, machine tools and alloy steels, among other things, but not carbon steel of which they had enough. In 1943 the Japanese machine tool industry produced 30,000 units.

Honored By N. M. T. B. A.

Ralph Flanders

James E. Gleason

Howard W. Dunbar

Canadian Tool Industry

Canadian machine tool builders will make only a few types of machines which they developed during the war period, said E. Barker, president Modern Tool Works, Ltd., and president Canadian Machine Tool Builders' Association. He pointed out that a considerable part of his industry's wartime work consisted of designing and building special-purpose machinery for arms and ammunition manufacture. Nevertheless the industry came out of the war with expanded facilities, trained machinists and specialized machine tool fitters, and a crop of young machine designers and engineers. It is now building a reasonably broad range of types, but not a complete range of sizes.

In the next decade Canada probably will make more types of tools, such as cylindrical and surface grinders and special-purpose multiway drilling and tapping machines, according to Mr. Barker. Output during the war rose to $18,500,000 in 1942, double the peacetime output. Mr. Barker emphasized that many of the apparent advantages of Empire preference do not exist, Canadian builders finding it hard to do business with India, South Africa, Australia and New Zealand. He deplored the U.S. reluctance to admit

machine tools from Canada.

Berna Discusses Shortages

Materials shortages, from pig iron to lead, were discussed by Tell Berna, general manager of the association. Unless these shortages are understood, he said, there is danger that the resultant shutdowns and layoffs will be seized upon as a reason for still more government guidance and control. He asserted that government surpluses must be made obsolete and that machine tool salesmen must roll up their sleeves and do aggressive and constructive selling. He reported that the association's electrical committee recommends that new machine designs should not be based on the exclusive use of new NEMA frame motors. For some time customers will have only the older 1940 frame motors on hand in case of breakdown, and the new NEMA frames will be scarce. Customers and the electrical committee will meet this fall.

Mr. Berna said that silica sheet steel for motors is becoming harder to get and that decontrol of steel scrap is required. As long as scrap is short, pig iron will be used as a substitute, which will only make matters worse, because pig iron is also short. He said many machine tool plants are faced with shutdowns for lack of castings.

Public Relations and Decontrol

The machine tool industry has a four-fold public relations job to do, said Louis Polk, president Sheffield Corp. and chairman of the association's public relations committee. The job is with prospects and customers, employees, people in the local communities, and the nation. The finest opportunity to do a job is with employees. "It is our grave responsibility," declared Mr. Polk, "to deserve and earn the friendship and confidence of our employees. Shop workers should be able to share as much as management in pride of the products they produce." He indicated that radio programs given in Cincinnati, Dayton and Milwaukee will be extended to other cities.

There is a good possibility of complete decontrol of machine tools by November, stated Phil Huber, president Ex-Cell-O Corp. and chairman of the OPA industry advisory committee. Removal is sure by December at the latest. Price control is on its last lap.

Tool Builders Honored

Three distinguished machine tool builders were honored at the association's dinner by presentation of special gifts: Ralph Flanders, chairman Jones & Lamson Machine Co.; James E. Gleason, president Gleason Works; and Howard W. Dunbar, vice president and general manager Grinding Machine Division Norton Co. Mr. Flanders was honored as president of the association in 1923-1924, Mr. Gleason as president in 1925-1926, and Mr. Dunbar for his war service to the industry in Washington 1940-1942. Neither Mr. Flanders nor Mr. Dunbar was able to be present.

Slides and movies of the Navy cruise by machine tools builders on the USS Roosevelt and USS Midway last June were shown at the dinner, with A. V. Bodine, president Bodine Corp., as the commentator. They were shown under the facetious title of "Machine Tool Builders at Sea."

Industry Weighs Regularized Jobs Against Guaranteed Annual Wages

WASHINGTON — Management is hearing a lot about "regularized employment" and "guaranteed annual wages."

The National Association of Manufacturers has launched a nationwide drive among its members urging them to concern themselves about "regularized employment." NAM points out that it is "good business from management's viewpoint because it reduces costs, increases efficiency, tends to raise productivity; (2) good for the workers because it reduces fear of unemployment, makes him more stable, able to plan; and (3) good for the public because it brings lower prices and stabilizes the economy."

"Guaranteed annual wage" is a catch phrase that organized labor has flung at management and the government. It hasn't been clearly defined, but could mean "regularized employment."

By "regularized employment," NAM has in mind a situation where an employer eliminates, or at least minimizes, the peaks and valleys of employment in his plant by stabilizing his production. This might be achieved by revising marketing practices, finding products to make in off seasons, building up inventories, or other means which would keep employment at a steady level.

NAM, Unions Differ

The "guarantee" is really the difference between what unions want and what the NAM has in mind. An annual wage is no problem to management once it has stabilized production and employment. But management feels it would be economically unsound to make a "guarantee" which would require it to pay someone who is not working. Costs would be prohibitive. Those who did work would have to accept less compensation to support those who didn't.

As C. E. Wilson, president of General Motors, recently said: "We are going to have to be a little careful in this country about how many people we start to pay for not working, in various forms." For many years, he said, General Motors has been studying its model change times, its inventories, and how it handles its business with the objective of stabilizing employment if possible.

Steady Production Essential

Thus, it is clear that the first practical step toward an annual wage must be achievement of steady production. In most cases, however, the flow of production is dependent on factors beyond a single employer's control. A manufacturer, for instance, would have difficulty regulating the habits of his consumers or the practices of his suppliers. It is recognized that the problem is a broad one involving coordination of the activities of many employers and even many industries. That's one reason why the government has engaged itself in the problem.

When the old National War Labor Board was faced with the issue in the basic steel case two years ago, it considered the annual wage of such broad national scope that it recommended an investigation of its possibilities and ramifications by a presidential commission. President Truman assigned the task to the Office of War Mobilization and Reconversion advisory board, which made Eric Johnston, former president of the U. S. Chamber of Commerce, chairman of the subcommittee.

The actual work is being done by a staff of economists under Murray W. Latimer, former chairman of the Railroad Retirement Board, under close supervision of the Johnston subcommittee. Thus far, the "guaranteed wage study," as it is called, has moved very slowly. It has just completed a detailed analysis of the various types of existing guaranteed wage plans. Soon it will study the problems of individual employers who want to find out whether an annual wage is feasible in their plant.

Foreign Report

BASED UPON MCGRAW-HILL WORLD NEWS BUREAU REPORTS

Indian Machine Tool Industry

BOMBAY, INDIA—To help its industrialization, India is seeking to develop its small machine tool industry, most of which only came into being with the war. Even with the assistance of government orders, her present productive capacity is estimated at only 5,000 units annually, and only a small proportion of that is of "Grade I" (accuracy equal to imported units) rating. Production of Grade I equipment is limited largely to standard lathes with a few firms making milling, shaping and planing machines and drills.

Greatest lack so far has been a shortage of "know how." Her steel mills are producing alloy and tool steels of requisite quality.

However, the Indian industry is seeking to hold its present ground and get a larger share of the area's machinery business, and has petitioned the Tariff Board, through the All-India Manufacturers Assn., to set up import controls and duties to protect the tool builders. The Engineering Assn. of India, representing metalworking industries, has outlined this program which should draw some action soon from the new Interim Government:

1. The Machine Tool Controller should bar imports of types of machine tools similar to those made in India, subject to advice of a committee of industry representatives.
2. Protective duties should be levied on types of tools, now imported, but likely to be made in India over the next five years, thus encouraging manufacture of new types of equipment.
3. The Government should arrange for the training of engineers from Indian tool manufacturing firms in foreign plants.

To Restrict Imports

Under such a program, standard lathes would be the first to be afforded protection, for they are the largest single item produced by Indian machine tool builders. There are about 15 domestic makers of lathes, most of whom produce "Grade I" units. There are at least 20 builders of drilling machines, of whom three make top grade equipment. Only three builders make horizontal milling machines, of which one produces first-class units. With respect to planers, only two out of eight producers make Grade I tools, while three out of eleven builders make top-grade shapers. There are only two makers of slotting machines and three builders of grinders, with one of the former and two of the latter making top-grade units.

Other makers of punching and shearing machines, bandsaws, circular saws, polishing lathes, lathe chucks, and drill chucks are largely in the lower grade category. However, it should be noted that most of the Indian machine tool builders got into the business shortly before or during the war, and almost all of them are engaged in related heavy industry lines. Most of them are small: Cooper Engineering has about 1,500 workers, half of which are skilled or semi-skilled; Hind Machines about 1,100 of whom 800 are skilled; India Machinery 800; Investa Machine Tools & Engineering has about 360 skilled and semi-skilled workers.

It is expected that these companies will expand, and that more builders will enter the field. But lack of housing in the cities and the necessity to train workers from the farms will tend to slow up this trend. Training should not be too difficult, especially in view of the observation of Dr. Henry Grady, head of an American technical mission to India, who found that Indians can be trained quickly in machine shop practices and precision work.

Paris Auto Show

PARIS—The first postwar international auto show had plenty of glamor, large crowds, sleek new models, but few sales. Most prospective buyers, attending the show at the fire-damaged Grand Palais from October 3-13, upon inquiring about delivery prospects could only get the answer: "Not for a year at least." American cars are out for the Frenchmen because of lack of dollars; and 70% of the small French production is earmarked for export.

American cars and trucks were prominently displayed and attracted more attention than any other single group. No English cars were shown, despite Britain's export drive; although a few British motorcycles could be seen at the back of the second floor.

Among the 800 exhibitors, Ford was represented in a display featuring a Mercury two-door, a Lincoln convertible, several 60-hp. models and four trucks produced in their French plant. Hudson showed its Super-6 convertible and Commodore tudor and four-door sedans, while Studebaker displayed its tudor and four-door Champions.

Packard was represented by a four-door green Clipper, Nash by a four-door "600" sedan, and Graham by a convertible.

French car builders introduced a wide variety of light-metal car and truck prototypes, some using welding extensively, some using single chassis-and-frame castings. In addition, French makers are striving to make smaller, more economical cars.

French Midget Cars

There were no startling departures among luxury models shown by the major French makers, although the biggest attention getter among them was a white and blue Delahaye sports convertible. Renault showed a 19 hp. 4-passenger model weighing 1150 lb., with a 4-cylinder rear motor. A tiny 13-hp., 1-cylinder Rovin, weighing 500 lb. and selling for $550, attracted tremendous interest. The Rovin is supposed to give 60 miles per gallon, while the Renault promises 40 miles. Another light car is the Panhard, a conservative 4-passenger 15 hp. light car, with a 2-cylinder motor forward. They all make great use of aluminum, now plentiful in France.

The small, established company, Irat, developed a 180-lb. one-piece chassis-frame-engine block made of magnesium, designed for a 3-place forward-drive coupe with a 90-inch wheelbase. With a body of duralinox, the whole car weighs 1,000 lb. Irat is said to be dickering with Willys-Overland and International Motors regarding the car.

American companies are also reported interested in the 840-lb. Mathis, designed by the engineer M. Andreau. It is a three-wheeler with an aluminum caisson instead of a chassis, and a welded aluminum body. Promising 67 miles per gallon of gas, the car has a 3-place forward drive, with a motor driven by two flat-opposed cylinders.

Designers of these light cars tried to lick their chief problems—how to get traction and keep the car on the road—by judicious placing of the weight (either all forward or all back), by low center of gravity, and by individual springing of the wheels.

Most streamlined car in the show, a tear-drop rear-powered model, designed by Wimille, Leygonie and Viel, has three seats with a middle movable one for the driver. Weighing 2500 lbs., the car is powered with a 54 hp., V-6 Citroen motor, can hit 95 mph. The chassis consists of two braced 12 mm. steel tubes.

Spotting the Air News

Sweep-back Propellers

Sweep-back blades may keep propellers in the airplane speed race, alongside of jet power, for a long time. Curtiss-Wright has built a three-blade sweep-back prop, and National Advisory Committee for Aeronautics has been testing the principle for more than a year. Sweep back in prop blade has same effect as in wing: it presents only a given point in the leading edge to compressed air shock wave at any given moment. Whereas the wing sweeps back in a straight line, propeller blade sweep is curved, because of various speeds at various stations from the hub. Propeller thrust is more efficient than jet at low airplane speed. Sweep-back will help it to compete with jet, which is more efficient at high speed.

Tri-Motor Transport

Northrop's development of its Pioneer tri-motor transport plane goes back to the Fords and Fokkers of the late '20s and early '30s. It is the first U. S. airplane designed mainly for export—South America, with its restricted airports and lack of surface transport, is chief prospect. The tri-motor lost out because: (1) nose engine on large fuselage was inefficient; (2) wing engine ships had less vibration in fuselage. Clean lines and smooth engines in these days minimize those problems. Tri-motor has obvious performance advantage over twin when one engine fails. Pioneer wing is designed for short ground run. Landing gear is non-retractable.

Aircraft industry took a free fall from $16½ billions annual output at war peak to less than $1 billion in 1946; is now going extensively into non-aviation lines in effort to occupy expanded facilities and hold skilled staffs. (Fortunately most of industry's war plants were built by RFC and are now in surplus or standby.) Aircraft companies are producing aluminum and plywood boats, canoes; casket shells; metal furniture; food, oil, wine making machinery; photo emulsion; light structural materials; motor trailers; shower stalls; water tanks; freezing units; gasoline engines; gas turbines; washing machines. Companies are using aircraft jig-tool-die technique on production line, designing for high strength-lightweight, and eye appeal.

Prefabricated Houses

Douglas, McDonnel, Goodyear, Consolidated, Ryan and two or three other aircraft companies are seriously considering building prefabricated aluminum panel houses, under sponsorship of National Housing Administration, which would guarantee 90% of costs by buying houses not sold. NHA, which will furnish approved designs specially adaptable to aircraft plant technique, is pressing Douglas to set up for 200,000 units. If companies build total 500,000 units, as requested, aviation house business would far exceed industry's airplane business. If public accepts prefabs, after being forced to try them in emergency, shelter building might tend away from construction industry toward indoor factory industry.

De-icing Techniques

Civil Aeronautics Board has abandoned its proposal to require thermal de-icing in all transport aircraft by end of 1947. Heat de-icers are of two kinds: (1) air heated through exchangers on the engine exhaust; (2) air heated by gasoline burners. From either type, hot air is ducted through wings and tail section under critical areas. Industry and government engineers said heat de-icing is not sufficiently developed for standardization; might cause corrosion; might carry escaping carbon monoxide into cabins; might take in escaping raw gas, at fire risk. All new transports in production have heat de-icers; if CAA tests show faults they will be disconnected before certification of the airplane type. All agree that thermal de-icing is best prospect of solving this old problem, which may prevent full schedule performance even after weather has been beaten by navigation aids.

Postwar Navy Scout—Powered with a Curtiss-Wright cyclone engine, this plane, shown here just before its final test flight, has a speed of more than 250 m.p.h. and a range in excess of 650 mi. Driven by a four-bladed motor, the plane is normally operated with Edo floats, with a seat located inside the fuselage back of the cockpit for rescue work

Fairbanks, Morse Has Diesel Engine Backlog of $75,000,000

CHICAGO—Fairbanks, Morse & Co. reports a backlog, largely for diesel engines, amounting to $75,000,000. Although the company was shut down by a strike for almost six months, sales today are running 5 to 10 per cent ahead of last year. The firm will spend more than $750,000 on expansion of its Beloit, Wis., plant, and a comparable amount on the Pomona, Calif., plant. Company officials, however, said they were proceeding cautiously with expansion plans.

The company's Beloit expansion will include facilities for production of diesel-electric switching locomotives as well as freight and passenger locomotives. All road locomotives now are being built by General Electric at Erie, Pa. Fairbanks-Morse will definitely make a bid to seize a good part of the competitive diesel-electric business. Output now runs to four switchers a month. Since Fairbanks-Morse is a large producer of electrical equipment in addition to its other lines, close observers believe the company will ultimately integrate its railroad operations and manufacture generating equipment as well as diesels and locomotive bodies. General Electric and Westinghouse now supply its generators.

Westinghouse Mexican License

PITTSBURGH—Westinghouse Electric Corp. has agreed to supply technical information and training, under a long-term license agreement, to the newly-formed Industria Electrica de Mexico, S. A. The new Mexican firm, a $15,000,000 company backed by American and Mexican interests, will produce electrical equipment ranging from motors and generators to household appliances. Westinghouse will provide for all technical phases of the operation, and will train Mexican personnel in its plants.

Increased Use of Magnesium Described At Annual Meeting

NEW YORK—Consumption of magnesium today is more than ten times what it was before the war, Dr. J. D. Hanawalt, general manager of the Magnesium Div., Dow Chemical Co., told members of The Magnesium Association at their third annual meeting. Dr. Hanawalt stated that the industry's advertising campaign in recent years had been so successful that a major department-store executive had declared "magnesium" was second only to nylon in sales appeal.

September output of cast and wrought magnesium was estimated at more than 1,500,000 lb. Predictions for consumption next year varied from 25,000 to 100,000 tons. It was reported that there is a 6-months backlog of orders for commercial sand castings. Strangely enough, there is excess rolling capacity for magnesium sheet.

Dr. Hanawalt predicted in his address that ingot prices will continue to drop relative to other metals when a reasonably large and steady volume of production is attained. He warned, however, that most of the future reduction in costs must come through improved methods of fabrication.

Future of Magnesium

Ralph M. Heintz, of Jack & Heintz Precision Industries, predicted that bridges and the structural framework of buildings will be made of magnesium eventually.

At the First International Magnesium Congress, held at the same time, Major C. J. P. Ball, Chairman of the Board, Magnesium Elektron, Ltd., discussed development work on alloys containing zirconium. The result of zirconium is to give a fine grain structure and high strength. It was later learned that alloys containing zirconium and zinc are used in experimental aircraft in the U. S.

In the exhibit hall there was much interest in a full-size truck body of magnesium shown by Revere Copper and Brass Inc. Several of these are already in use. A variety of consumer products, ranging from lawnmowers to pianos was displayed.

In the annual address of the president, Edward S. Christiansen, president of the Magnesium Co. of America, said that 58 companies were now producing magnesium.

New officers elected at the meeting are: president, R. D. Taylor, assistant manager for eastern operations, Federated Metals Div., American Smelting & Refining Co.; vice president, J. D. Barrington, vice president and general manager, Dominion Magnesium Ltd.; treasurer, Irving T. Bennett, vice president, Revere Copper and Brass Inc.

Names in the News

C. M. Taylor

Wesley N. Gordon

C. M. Taylor has been elected executive vice president of The Lincoln Electric Co., Cleveland. He joined the company in 1916 and advanced through various departments until he was appointed a member of the board in 1927 and vice president in charge of sales a year later.

Wesley N. Gordon has been appointed manager of the alloy sales division of the United States Steel Supply Co., Chicago.

C. R. Dobson has been elected vice president in charge of operations of H. K. Porter Co., Inc., Pittsburgh, Pa. He was formerly chief industrial engineer of the Jones & Laughlin Steel Corp.

James J. Walker, formerly with General Motors Corp., has been named general manager of the west coast plant of Willys-Overland Motors, Inc.

Arthur P. Shanklin has been named vice president and general sales manager of Carrier Corp., Syracuse, N. Y. He has been with the company for 24 years and has served as vice president for five years.

Walter B. Schulte, president of Micro Switch Div., First Industrial Corp., Freeport, Ill., will retire on Dec. 15. He will be succeeded by **William W. Gilmore,** executive vice president.

Chester H. Kimmel has been appointed manager of Camshaft and Crankshaft Divisions of The Ohio Crankshaft Co., Cleveland. **Morgan R. Kavanagh** has been appointed factory manager of the divisions.

William F. Sanford has become president of Atlantic Plastics, Inc., Flushing, L. I., N. Y., while **Joseph E. Benoit,** former general manager, has been made vice president. Also, **Carl T. Haugen** has been named chief engineer for the firm.

Robert T. Dunlap has been elected executive vice president of the Colorado Fuel & Iron Corp., with headquarters in Buffalo, N. Y.

R. D. Houghton has been named general manager of the industrial machinery division of The Milwaukee Chaplet & Mfg. Co., Milwaukee, Wis.

C. Edward Price has been elected president of the Peninsular Grinding Wheel Co., Detroit. He joined Peninsular 11 years ago as sales manager and was later named vice president in charge of sales. Also **James M. Surbrook** has been elected vice president of the company. He will continue as treasurer, a post which he has held for four years.

C. Edward Price

James M. Surbrook

Archie W. Bennett and **William A. Boyle** have been promoted to vice presidents of the U. S. Hoffman Machinery Corp., Syracuse, N. Y. **J. W. Bennett** has become works manager.

Harold J. Dinsmore, works manager of the Haloid Co., Rochester, N. Y., has been elected vice president of the company.

Albert M. Stedfast has been elected president of Stedfast & Roulston, Boston, Mass., to succeed his father, the late **Albert M. Stedfast.**

Harry A. Sutton has been appointed assistant to the president and engineering advisor to the Ryan Aeronautical Co., San Diego, Calif.

Frederick A. Purdy has been appointed manager of the new Los Angeles plant of Joseph T. Ryerson & Son, Inc.

Walter W. Haskins has been appointed manager of the Chicago office of The L. S. Starrett Co., Athol, Mass., to succeed the late **Albert W. Smith.**

BUSINESS ITEMS

Jas. H. Matthews & Co., manufacturer of industrial marketing devices, has formed a Southwestern District Sales Office with headquarters in Dallas, Texas. **Walter S. Beecher** has been named district sales manager and will be located at 2817 Lovers' Lane.

The Geometric Tool Co., New Haven, Conn., has appointed **Tools & Supplies, Inc.,** 3131-3137 Olive St., St. Louis, Mo., as its representative in that area. It also has moved its Detroit office to 2870 E. Grant Blvd.

Midwest Alloys, Inc., St. Louis, Mo., has been incorporated by **John Sonnenfield,** president, at 1200 No. Rockhill Rd. The company will manufacture heat resisting and stainless steel castings.

Apollo Steel Co., Pittsburgh, has sold its plant and inventory to **Irving Grayson.** Before liquidation, the company will change its name to the **Apollo Pittsburgh Corp.**

Electro-Motive Div., General Motors Corp., has established a regional field service organization with headquarters in St. Louis, Mo., to have the control of parts and service closer to the railroads operating GM diesel locomotives.

Voss Machinery Co., 2882 W. Liberty Ave., Pittsburgh, has been named distributors in that territory for the **Stokerunit Corp.,** Milwaukee, Wis. and will sell and service Simplex machine tools.

Ahlberg Bearing Co., Chicago, has moved its Kansas City office to larger quarters at 1517 Walnut St.

The Asco Corp., Cleveland, has moved to larger quarters at 17702 Waterloo Rd.

Permanente Products Co., merchandisers of plate, sheet and strip aluminum, has opened an office at 6 E. Eleventh St., St. Louis, Mo.

Federal Products Corp., Providence, R. I., has acquired the exclusive manufacturing rights to the Federal-Metricator Air Gaging System. The manufacturing facilities, formerly in Ann Arbor, Mich., have been moved to Providence.

John K. Edmonds & Associates has been formed at 44 E. Broad St., Columbus, Ohio, by **John K. Edmonds.**

Independent Pneumatic Tool Co., Chicago, has opened a new branch office in Cincinnati at 426-428 Elm St. with **W. C. Rush,** formerly of the St. Louis office, as manager. Also, **J. A. Hill,** formerly manager of its New York City office, has been named manager of electric tool sales.

Misener Mfg. Co., Syracuse, N. Y., manufacturer of circular saws, has moved its operations to recently acquired buildings at Walton and Franklin Sts.

The Denison Engineering Co., Columbus, Ohio, has appointed the **Robert R. Stephens Machinery Co.,** 3615 Olive St., St. Louis, Mo., as its exclusive representative in the sale and distribution of its Multipress in Mo., Kan., Ark., Colo., and parts of Ill. and Okla.

Ford Motor Co., Dearborn, Mich., has reorganized its engineering division on an operational basis. **William S. James** will head the research department; **V. Y. Tallberg** is in charge of the engineering division; while **Dale Roeder** is chief engineer of the commercial vehicle department; and the passenger car engineering department has been divided in two with **H. H. Gilbert** heading the Lincoln-Mercury division and **H. S. Currier** in charge of the Ford group.

The Acme Broach Corp., E. Third St., Lexington, Ky., has started the production of broaching machines and tools. Officers of the firm include: **E. J. LaPointe,** president and **Francis J. LaPointe,** executive vice president.

OBITUARIES

Edwin S. Todd, 77, president of the Clark Brothers Bolt Co., Milldale, Conn., died Sept. 16. He joined Clark Brothers in 1892 as an office boy and was elected president in 1925.

Alvin P. Greene, 73, for 19 years operator of the Greene Machine Co., Watertown, N. Y., passed away Sept. 18.

Charles A. Xardell, 71, a manufacturer of automobile accessories in Utica, N. Y., died Sept. 25. He was associated with the Bossert Manufacturing Co. and the Rome Manufacturing Co. before organizing his own business which he conducted for 30 years.

D. T. Williams, 91, retired founder of the D. T. Williams Valve Co., Columbus, Ohio, died Sept. 27.

MEETINGS

American Gear Manufacturers Association. Semi-annual meeting. Edgewater Beach Hotel, Chicago, Ill. Oct. 28-30. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

American Management Association. Production meeting. Palmer House. Chicago, Ill. Nov. 14-15. American Management Association, 330 W. 42 St., New York 18, N. Y.

American Society for Metals. Municipal Auditorium, Atlantic City, N. J. Nov. 18-22. Graves Taylor, 7301 Euclid Ave., Cleveland 3, Ohio.

American Society of Body Engineers. Technical Convention. Rackham Memorial Bldg., Detroit, Mich. Oct. 23-25. Carl W. Cenzer, chairman, 100 Farnsworth Ave., Detroit, Mich.

American Welding Society. Annual meeting. Atlantic City, N. J. Nov. 17-22. American Welding Society, 33 W. 39th St., New York 18, N. Y.

Industrial Management Society. Tenth Annual National Time and Motion Study Clinic. Hotel Continental, Chicago, Ill. Nov. 6-8. R. R. Landes, general chairman, 176 W. Adams St., Chicago 3, Ill.

National Association of Manufacturers. Annual Congress. Waldorf-Astoria Hotel, New York, N. Y. Dec. 4-6. National Association of Manufacturers Association, 14 W. 49 St., New York. N. Y.

National Exposition of Power and Mechanical Engineering. Grand Central Palace, New York, N. Y. Dec. 2-7. Charles F. Roth, manager, Grand Central Palace, New York, N. Y.

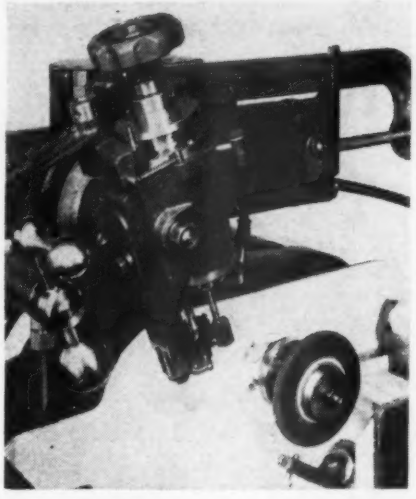
National Metal Congress and Exposition. Municipal Auditorium, Atlantic City, N. J. Nov. 18-22. W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

National Tool & Die Manufacturers Association. Annual meeting. Congress Hotel, Chicago, Ill. Oct. 23-26. George S. Eaton, executive secretary, 1412 Union Commerce Bldg., Cleveland 14, Ohio.

Society of Automotive Engineering. National Fuels and Lubricants meeting. The Mayo. Tulsa, Okla. Nov. 7-8. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

Shop Equipment News

Blake Spiral-point Tap Sharpener Grinds Straight or Angular Flutes



The diamond-truing device, located below the grinding wheel, is mounted on the same cross-slide as the spindle

A spiral-point tap sharpener, the Blake Flute Grinder, is announced by the Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass. Both the spiral point and straight flutes of taps or other straight- or angular-fluted tools can be sharpened.

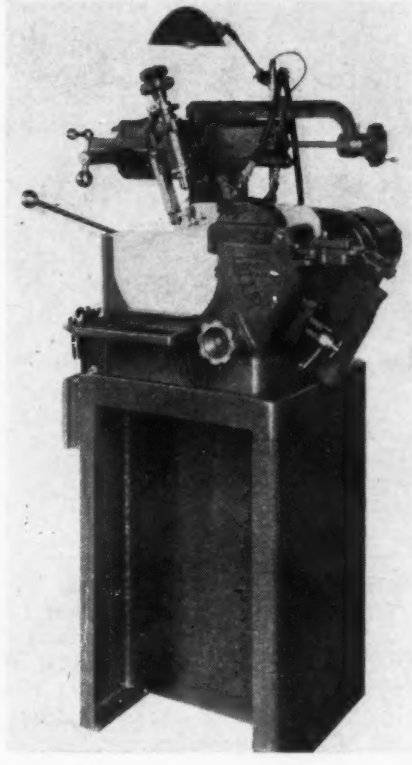
The self-contained machine is designed so that the loading, indexing and feeding are performed with the operator's hands far removed from the grinding wheel. The operator's body is outside the plane of the grinding wheel. Grinding dust, even when operating without coolant, is thrown downward into the bottom of the coolant collector pan.

To hold the tap, a special radius-grip, drawn-in collet grips the shank with sufficient force to keep the tap from slipping in the collet, but not so stiffly as to prevent setting firmly into the back-rest bushings when the tap makes contact with the grinding wheel.

A self-retracting locating arm containing a pawl pin is used to locate the tap for grinding. The pawl pin is inserted into the nearest flute, and completion of the swing of the locator arm turns the tap to the proper grinding position. The collet is tightened and the first flute ground. An index plate positions the remaining flutes.

The collets are held in a workhead spindle which turns to provide the required index. The complete workhead operates on a vertical slide and is counterbalanced by a weight, allowing the workhead to be moved up and down on the slide with an adjustable operating lever. The workhead can be swiveled to any desired angle, for grinding either straight flutes or angles.

Rapid- and micrometer-feed crosswise movement of the workhead is provided. The grinding wheel spindle is adjusted on a cross-slide with a screw that has a micrometer-reading dial, to allow quick and accurate offsetting of the grinding wheel. The diamond-truing device is always central with the grinding wheel. Movement of the diamond is controlled from outside the machine, permitting dressing at any time. Control of the wheel thickness as well as radius dressing is possible.



Blake flute grinder for sharpening spiral-point taps. In grinding spiral points, each flute must be ground separately

The coolant-pump motor is controlled by the same switch that controls the spindle motor. Either grinding oil or soluble coolant may be used. Grinding dust is handled by downward rotation of the wheel at the point of grinding and downward direction of the coolant stream. The coolant system is a separate unit which can be used when desired.

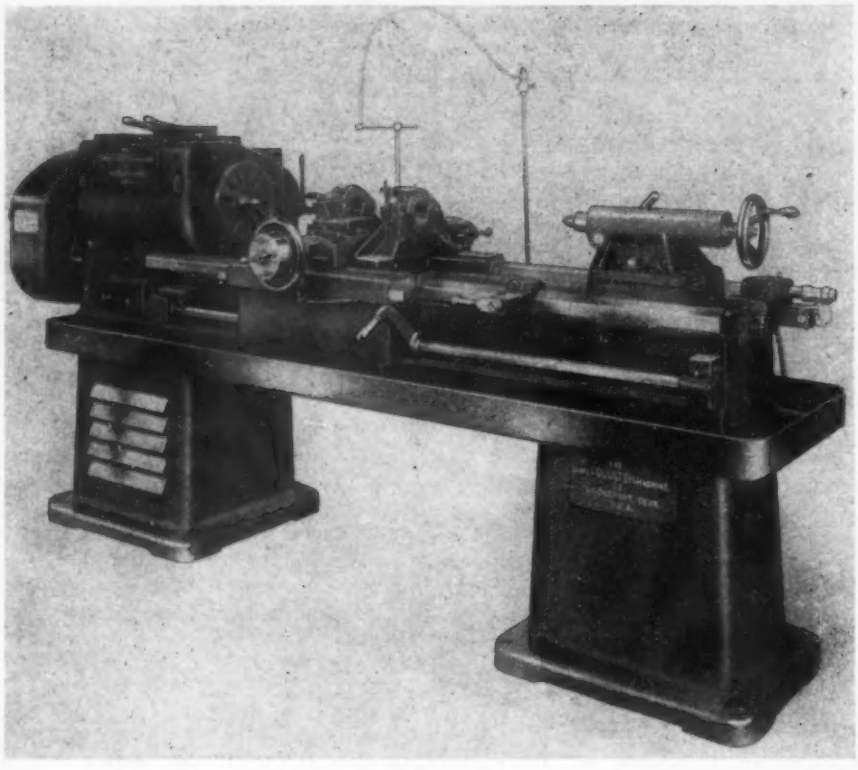
Right- and left-hand taps up to $\frac{5}{8}$-in. diameter can be handled. Under certain conditions, larger taps can be handled. With standard equipment, two-, three-, and four-flute taps can be handled. Index plates can be furnished for grinding taps having a greater number of flutes.

Lawrence 40 x 48-in. Pallet Handled by Pallet Exchange

Development of the Lawrence Universal Pallet and establishment of a pallet exchange, are announced by Lawrence Universal Pallet Corp., San Francisco, Calif. The pallet measures 40 x 48 in. and is made of replaceable wooden components. It can be handled by a fork-lift truck from four angles of approach.

Pallets will be delivered and redelivered to members of the exchange in carload or truckload lots. Pallets are assembled by bolts and damaged parts can be replaced.

Coulter Automatic Threading Lathe Cuts Traversing and Feed Screws



Internal and external threads can be cut on this automatic threading lathe made by James Coulter Machine Co.

An automatic threading lathe, Type A, Model L1, for threading long traversing, elevating, and feed screws, is announced by James Coulter Machine Co., 629 Railroad Ave., Bridgeport, Conn.

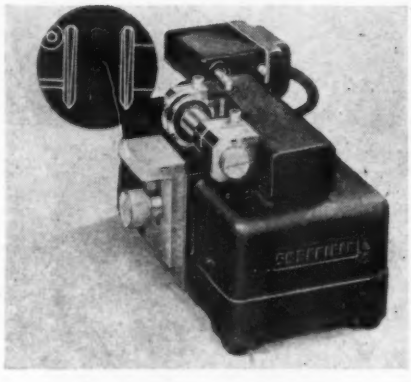
The machine is equipped with a disk clutch and a starting and stopping lever is within easy reach of the operator at all times. The machine has a 4-speed headstock, accommodates a large range in diameters and a variety of materials. Idle travel speed is five times the cutting speed.

New Whitman and Barnes Drills Made Short for Screw Machines

Short-length drills for use in screw machines are announced by Whitman & Barnes, Div. of United Drill and Tool Corporation, Detroit 16, Mich. The drills are properly proportioned as to length, web thickness, and flute contour.

They are made in fractional sizes 1/16 to 2 in., wire gage sizes No. 1 to 60, and letter sizes A to Z, in both right- and left-hand cuts.

Sheffield Gage for Thread Lead Checks 4½ to 60 Threads Per In.



A production Leadchek which has truncated cylindrical gaging anvils that are adjustable, is announced by The Sheffield Corp., Dayton, Ohio. They make possible precision checking of thread lead within a range of 4½ to 60 threads per in. to an accuracy of 0.0001 in.

Flexibility to accommodate a wide diametrical range of work is said to be combined with ease of initial set-up to suit the gage for use in receiving, production and final inspection, or for checking small lots in a wide range of sizes.

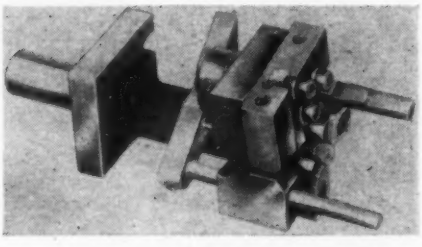
The gaging anvil can be moved and locked in place at any point within a range of 0.200 to 2.000 in. Both gaging anvils are adjustable for the desired pitch by rotating on their mounting shafts. Either a dial indicator or an Electrigage can be used as the gaging head. The Electrigage is an electrical gaging head developed jointly by Westinghouse and Sheffield.

K-D All-Steel Hacksaw Frame Fits Blades of Various Length

An all-steel hacksaw frame, No. 99, is announced by the K-D Mfg. Co. The saw will get into narrow openings down to 3/16 in.

Stops are provided on the frame to fit 3, 4½, 6, 10 and 12-in. blades. Broken blades can be used by annealing and drilling a new hole on any of these centers.

Profiles Turned on Lathes With M.R.E. Turning Box

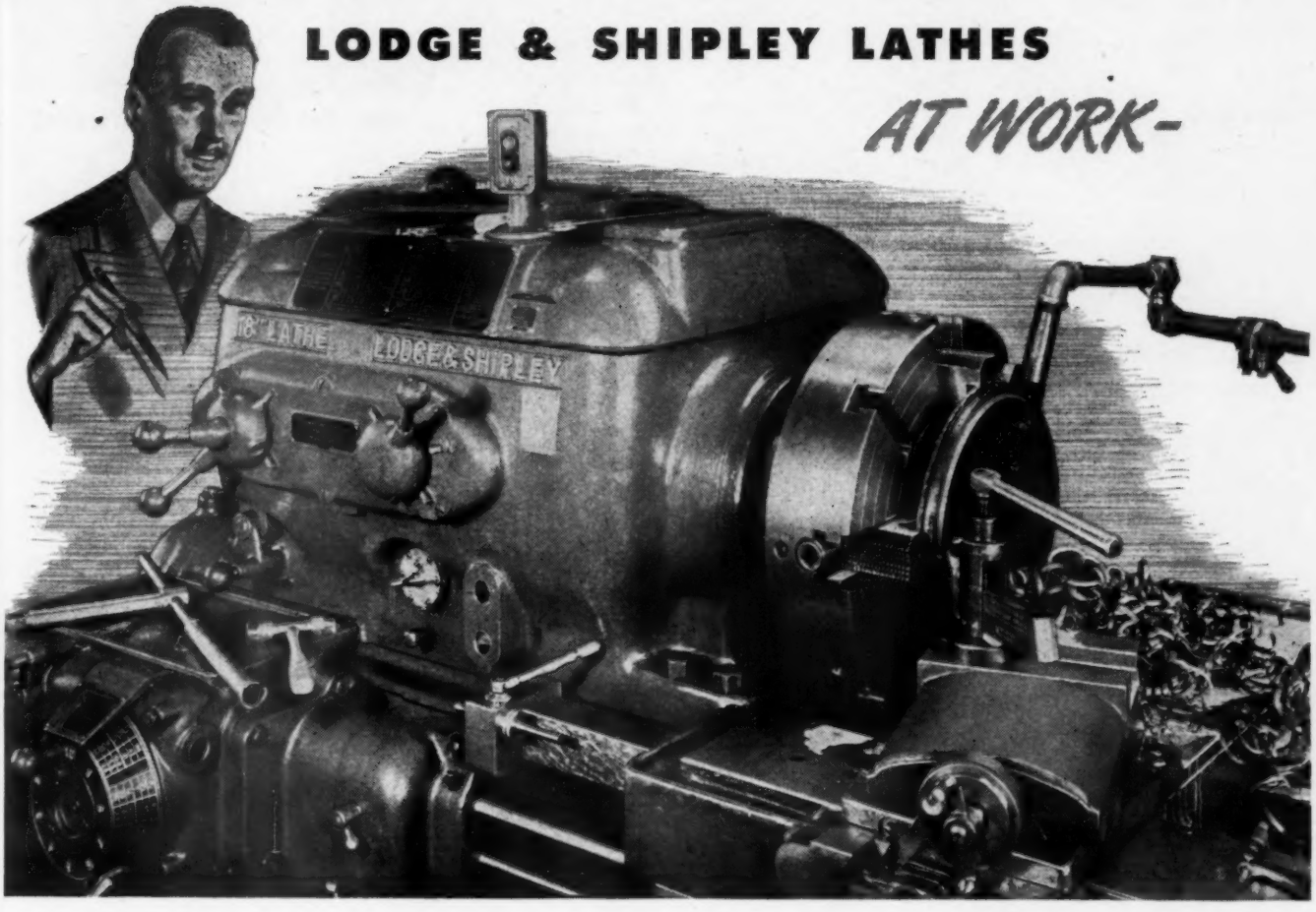


A unit for profile turning on lathes, M.R.E. Profile Turning Box, manufactured by Manchester Repetition Engineers Ltd., is distributed in the United States by Accreylon Co., 130 W. 42 St., New York 18, N. Y. The profile arrangement can be used for turning multi-diameters, contours, tapers, and other profiles at one pass of the box. It eliminates the use of two or more roller boxes or forming tools, leaving extra turret and cross-slide stations for other operations.

The profiling arrangement is so designed that a square face can be left on the work when increasing diameters, but a radius is formed on decreasing diameters. The profile bars are made of water- or oil-hardening steel and the profile is formed along one side of the bar.

The tangential tool is held in a fixed slot by means of two clamping screws and washers and the depth

LODGE & SHIPLEY LATHES AT WORK-



OUTPUT: "greater than any lathe in our shop"
ACCURACY: "by far the most accurate lathe"

AMERICAN MFG. CO., TACOMA, WASH.

Rather broad statements you might think. But they're backed up by actual experience in this noted plant . . on every day production of a wide variety of precision machine parts—axles, gears, sprockets, worms, bearings, cylinders, clutch yokes and valves.

On every type of machining operation: turning, boring, facing, threading and tapering, this customer found the Lodge & Shipley lathe unequalled. In producing their plywood and sawmill machinery as well as passenger, industrial and freight elevators, American Mfg. Co., production men noted that "The bulk of our precision work is handled by the L & S—because of its accuracy, time is saved."

This exceptional performance is typical of outstanding results reported by users of the new series of 18, 20 and 22 inch L & S Lathes. These lathes are completely new and improved in every detail from pulley to tailstock . . . can do your work better and at far lower cost—possibly replace several older, worn and weary tools.

L & S Engineers will be glad to show you actual cost and production figures . . . demonstrate on your own work just how these modern lathes can improve your production—cut your costs. Write on your company letterhead for detailed information in Bulletin Nos. 503, 605 and 606.

ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC) LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.
L & S LATHES
CINCINNATI 25, OHIO, U. S. A.
MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

of cut is adjusted with a screw bearing on the profile bar slider without loosening the tool. A further screw allows for the fine adjustment of the cutting edge of the tool to the center of the work. The unit is made in three sizes, the smallest of which is illustrated.

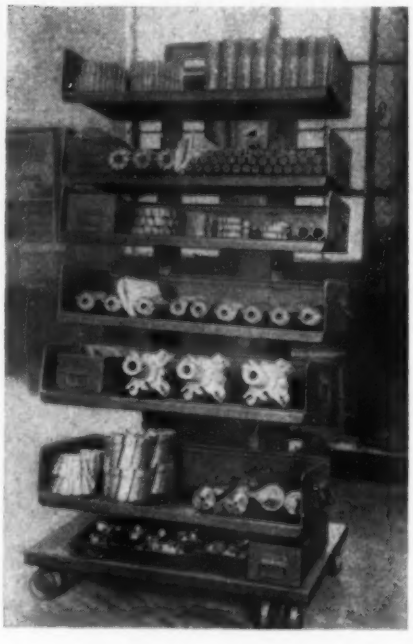
Strauss Hot Press Produces Dense Powder-metal Test Pieces

The National Diamond Hone & Wheel Co., 108 Fulton St., New York 7, N. Y., is now producing a machine designed by Harry L. Strauss, Jr., to hot press non-ferrous powder metal parts on a laboratory basis. Advantages of the machine are said to be: (1) by the hot pressing process, slugs 3/16 in. in diameter by ¼ in. long can be produced with a density approaching that of a cast or wrought material, and (2) combinations of powder materials impossible to produce otherwise can be made for study in connection with product or tool needs. For example, it is possible to make diamond-impregnated tool materials, or a copper-nickel-cobalt alloy that could only be produced by centrifugal casting and perhaps not with the desired uniformity of structure. Combinations containing titanium hydride can be hot pressed.

Importance of hot pressing is said to be this: the completed piece can be produced in a minute or two as contrasted with a pressing cycle followed by long sintering in an atmosphere furnace. Besides, by applying the correct temperature during pressing, accelerated diffusion of the ingredients is secured, plus strength equal or superior to that of slugs made by the customary longer cycle.

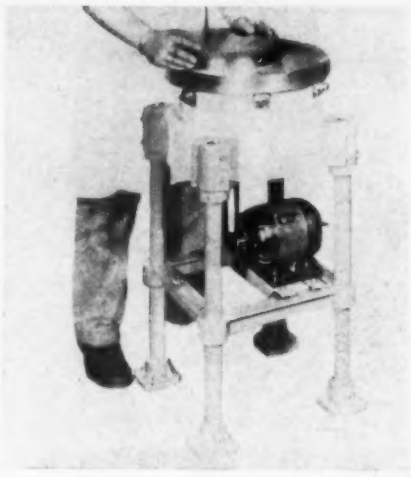
In use, the weighed charge is placed in a carbon die. Predetermined pressure is applied to the upper plunger by adjusting a weight on a lever. Meanwhile 115-v. current is applied to a pair of contacts which press upon side extensions of the specially made die. (These dies are furnished by the manufacturer.) Thus, the powder metal charge is heated simultaneously with the pressing action, attaining a suitable temperature. For example, bronze may be heated to 1550 F. Temperature is controlled by a pyrometer regulator or by a reduction in voltage.

At the end of the pressing stroke, the operator pulls out a slide in the ejector assembly, permitting the plunger and the compact to fall down a chute leading to a tray at the front of the machine. If desired, an atmosphere chamber can be interposed between the ejector and the tray.



RACK-CONVEYOR—The Master-Trays hung on this conveyor can be varied to suit the height of material handled. Made by The Rack Engineering Co., Butler St., Pittsburgh, Pa., the conveyor has 12 roller-bearing steel wheels with a swivel arrangement to provide maneuverability. Each tray will handle 300 lb.

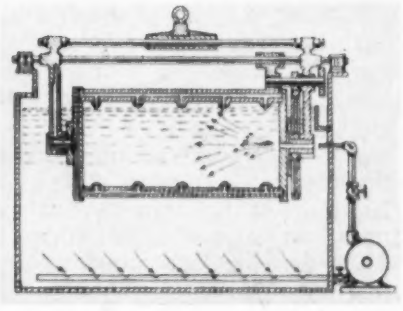
Spitfire Flat Lapping Machine Laps One Piece Without Holder



A high-speed precision flat lapping machine is announced by Spitfire Tools, Inc., 2933 N. Pulaski Rd., Chicago 41, Ill. Single pieces ordinarily require no holders, with the operator laying the piece on the revolving circular lapping plate and directing its motion with his hands.

Production lapping of large quantities of small parts is done with the aid of standard or special holders to suit the requirements. All gears and bearings are factory sealed in lubricant.

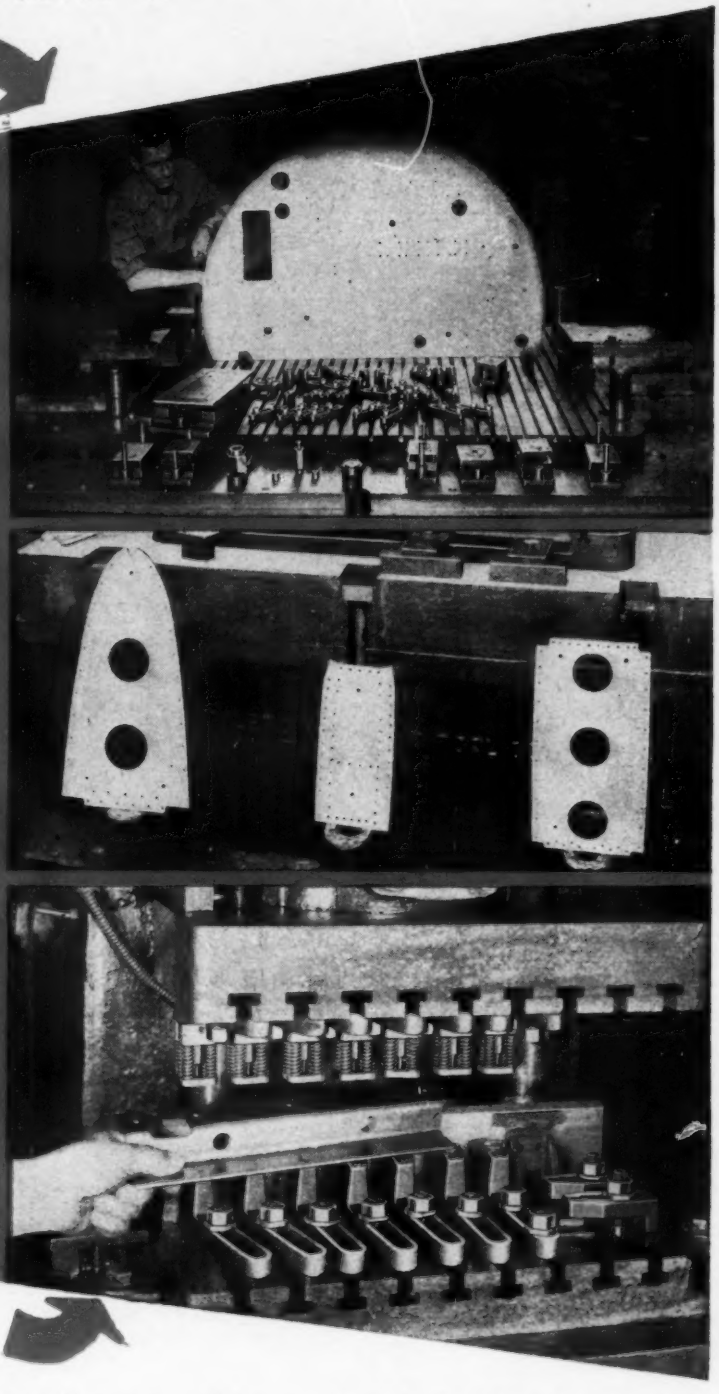
Pumping Circulates Solution In Mercil Plating Apparatus



The Mercil plating apparatus which includes pumping equipment is announced by Hanson-Van Winkle-Munning, Matawan, N. J. Tests are said to have shown that where the plating apparatus has pumping equipment, the plating time is reduced.

When working with cyanide solutions the amount of cyanide consumed is cut down and the carbonates in the bottom of the tank are reduced in volume. The solution is agitated by the pump and a

Some examples of what can be done with Whistler Adjustable Dies. Work in practically any type press.



Re-use same WHISTLER ADJUSTABLE DIES in unlimited combinations

1 To Pierce Holes of any diameter from 1/32" up.

2 To Perforate Special Shapes.

3 To Notch Corners.

Save production time and reduce product costs by having Whistler punch and die units in your tool room.

WRITE FOR YOUR WHISTLER CATALOGS. Know the production advantages of Whistler Adjustable Dies.

Whistler notching dies, group dies and standard units are especially adaptable to combined use in the same set-up. Continued re-use in a variety of arrangements quickly writes off original investment. Reason enough for their expanding popularity with hundreds of America's best known manufacturers.

Now available from stock in a range of diameters up to 3", shipment can be made the same day your order is received. Special sizes, shapes, notching and group dies are made to order in a few days.

You get production economy plus precision perforating in practically any press with these Whistler dies. Set-ups are easy and fast. No special tools required. Heavy duty series easily pierces 1/4" steel. All parts interchangeable. Tolerances maintained to .0002". There are many other advantages. Get in touch with Whistler.

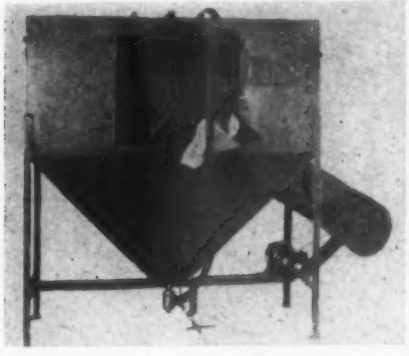
S. B. WHISTLER & SONS, INC.

752-756 MILITARY ROAD BUFFALO 17, NEW YORK

finer grade of plated work is said to be obtained.

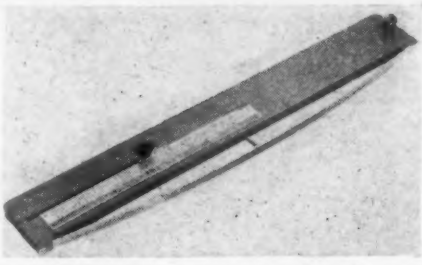
The solution is drawn off from the tank through a perforated pipe near the bottom and is pumped back into the tank through a pipe running the full length of the unit, situated directly under the overflow, allowing the solution to be pumped directly into the inside of the cylinder.

Leiman Sandblasting Machine Has Improved Door, Armholes



The sandblasting machine made by Leiman Bros., Inc., 136 Christie St., Newark 5, N. J., has been improved by the addition of a combination door and armholes with cuffs. The door is readily swung open for loading and removing work, or replacing the basket.

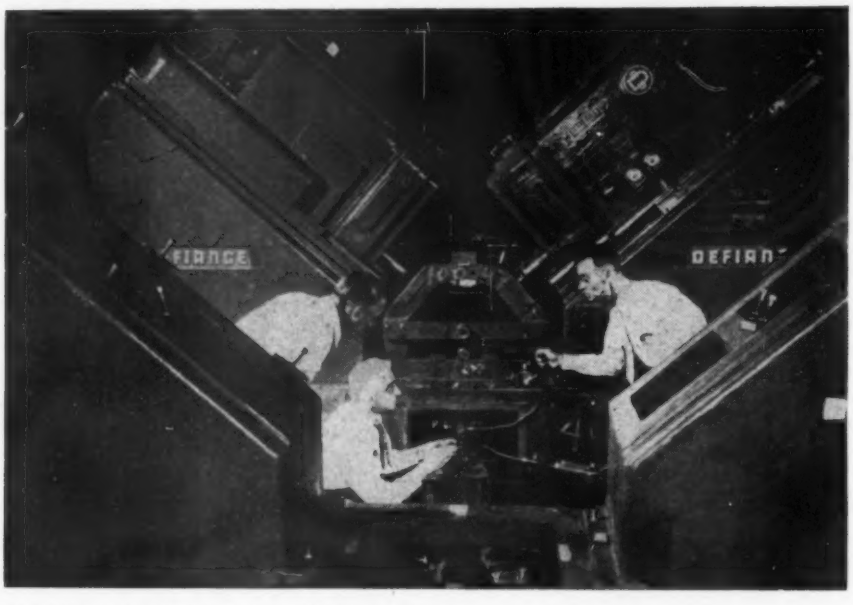
Arcs for Large-Scale Layouts Drawn with Help of Arcmeter



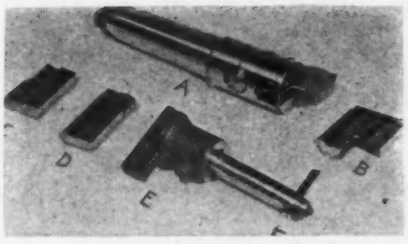
A unit designed to draw arcs of large radii for layout work on cutters, gears, gages, and other work where the projection method is used for checking, has been developed by the Arcmeter Co., 1025 21st Ave., Rockford, Ill.

A flexible steel beam is adjusted to form an arc of the desired radius by moving the indicator knob along the scale of the Arcmeter. Any radius from 34.2 in. to infinity can be obtained.

A fine center line is scribed at the exact center of the flexible spring. The back edge of the Arcmeter is parallel to the spring so that a series of arcs can be drawn along a center line. This is useful when determining outside radius, pitch radius, base radius, and root radius of a gear, for a large-scale layout to use on a projection machine.

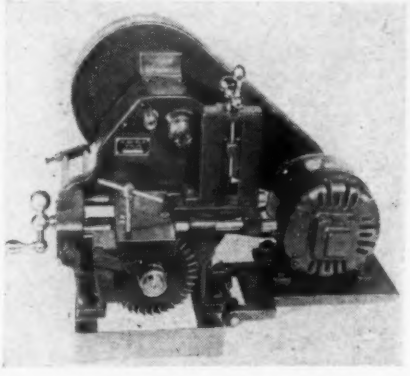


SPECIAL MACHINES—Valve holes and inserts in V-type engines are machined on a series of eight machines designed and built by Defiance Machine Works, Inc., Defiance, Ohio. The machines, which are No. 37 hydraulic units, are mounted in pairs on columns with the proper angle for machining the valve holes. A tunnel-type fixture is used. Locating pins and clamping arrangements are hydraulically operated, and the hydraulic units are electrically interlocked so the operator cannot start the cycle of the machine unless the hydraulic unit for the fixture is running



BORING BARS—Taper-shank boring bar A, made by Behr Products Co., Dept. 3, 1373 Woodward Ave., Detroit 3, Mich., is said to take cuts up to ¾-in. on a side without chatter. Standard facing cutter *B*, back-facing blade *C*, and end-cutting fly tool blade *D* are used with the bar. At *E* is a small hole adaptor for holes of less than 2-in. dia.

Grove Machine Cuts Off Bars, Mills Flat, Woodruff Keyways



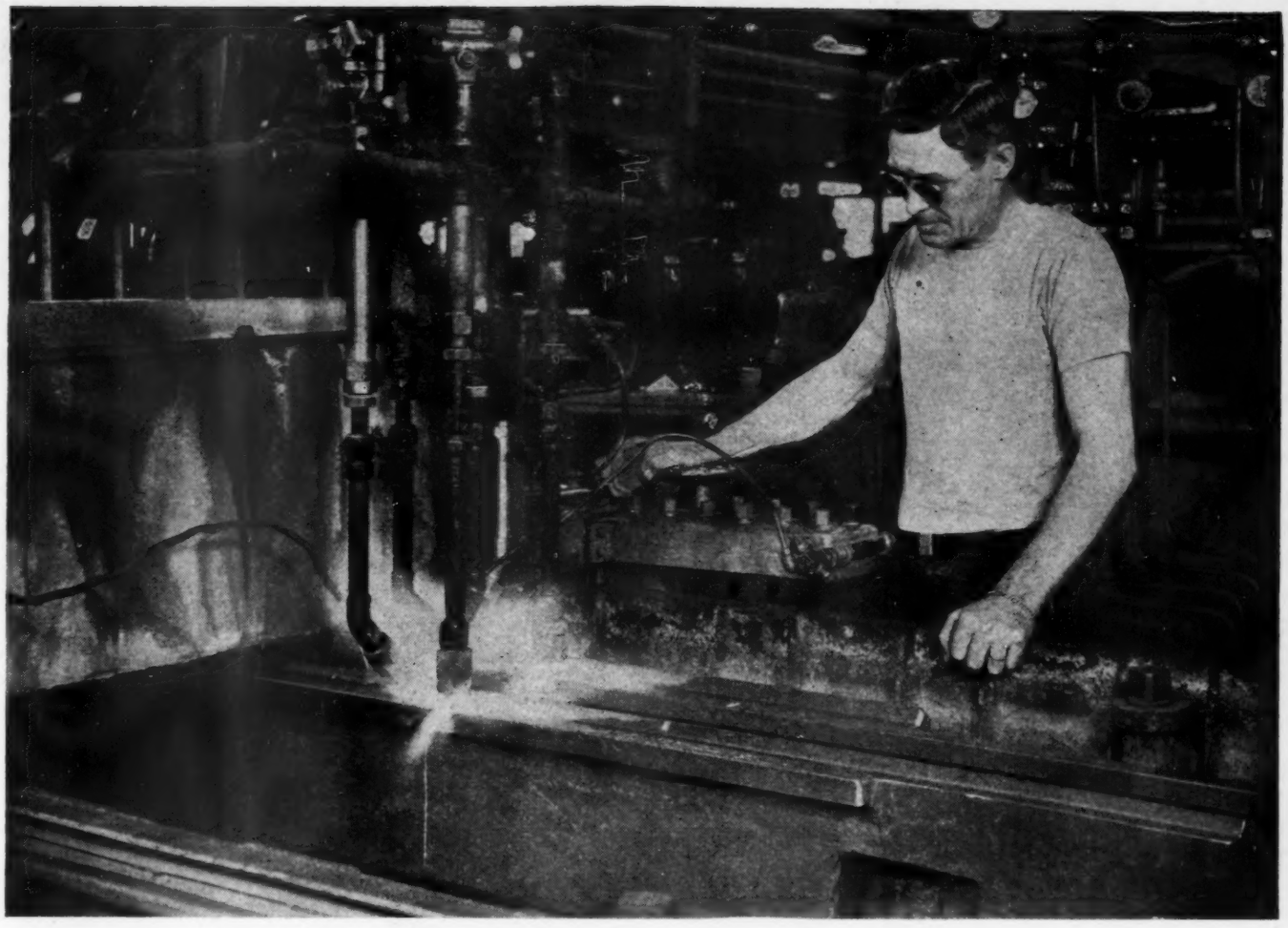
For cutting off bars to close tolerances with smooth mill-finished ends, a two-speed cut-off and keyway milling machine is made by the Grove Mfg. Co., Dayton 7, Ohio.

The machine is equipped with a stop for cutting stock to any set length. Round bars ¼ to 1-in. dia. and square bars ¼- to ⅞-in. can be cut off. The machine can be used to mill flat, straight keyways, or Woodruff keyways in bars up to 1-in. diameter. The machine has a hand feed.

Willey's Masonry Drill Line Made with Solid-Carbide Tip

A line of masonry drills with carbide tips is announced by Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 1, Mich. Sizes range from 3/16- to 1½-in. diameters. Used for non-metallic materials, they are said to give 75% faster drilling speeds without chipping.

Tips of the drills are protected with a plastic coating.



This Flame Hardening Keeps Monarch Lathe Ways "*Good as New*"—EVEN AFTER 1,090,000 CYCLES

"*. . . This fine tool was used in shell manufacture and during its time in use, approximately one year, turned the burr ring on one million, ninety thousand shells. In examination of the machine, we find the ways as good as new although the movement of the carriage was confined to a short space. This seemed amazing to us after our experience with the older types of construction.*"

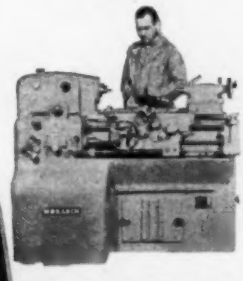
That's unsolicited, written testimony about a standard Monarch 10" EE Toolmaker's Lathe. What wasn't known is that such performance records are the *accepted*, rather than amazing, experience—for thousands of Monarch users everywhere.

More than 21,000 lathes have left our plant with flame-hardened ways since we first introduced the process for machine tool applications, back in 1937. It's one of the many plus features of Monarch Lathes—features that enable you to produce more for less. We'd welcome the opportunity to show you how Monarch can meet your metal-turning needs. May we talk it over?

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, O.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

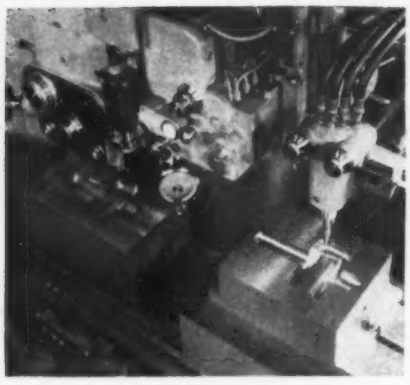


10"EE TOOLMAKER'S LATHE

Flame-hardened ways are one important reason why you'll get longer life and greater accuracy in this sensitive precision machine. For complete information and detailed specifications, ask for bulletin No. 10-EE.

YOUR PROOF OF PROTECTION— FOR LONGER LATHE LIFE

Cincinnati 16-in. Hydro-Tel Built in 3 Different Styles



The hydraulic automatic depth control is a sensitive hydraulic tracer mechanism which automatically synchronizes the vertical movements of the spindle carrier with either table or cross-slide feed movement to reproduce on the workpiece a contour of the templet

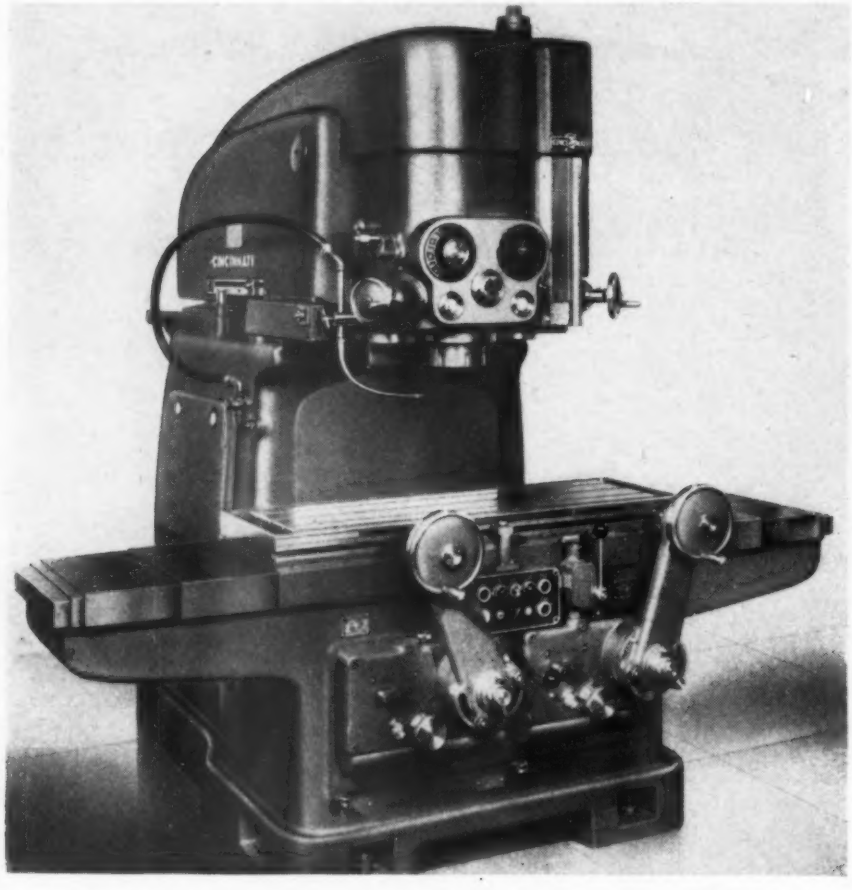
Latest addition to the Hydro-Tel line, the 16-in. vertical, is announced by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. The machine is built in three distinct styles: as a general-purpose milling machine, a die-sinking machine with automatic depth control, and automatic 360° profiling machine.

The basic machine consists of a fixed-height bed cast integral with the rear base. Wide-spaced, square-gibbed ways on top of the bed carry the table, with similar ways on the rear base carrying the cross-slide. The vertical-spindle carrier unit is mounted on the front face of the cross-slide.

When equipped as a general-purpose milling machine, the basic machine is provided with hand and power feed to the table and cross-slide, hand feeds for vertical positioning of the spindle carrier. It can be used for general purpose work or for hand-controlled, die-sinking operations.

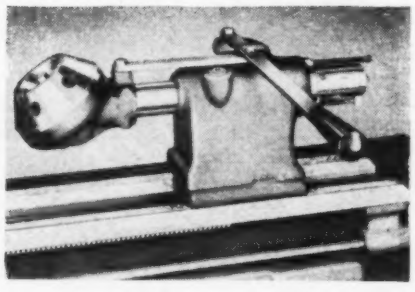
Addition of an automatic hydraulic-tracer mechanism makes the die-sinking machine. In the third variation, an automatic, hydraulic 360° profiling mechanism is added, supplied for tracer-controlled profiling work.

An automatic feed cycle of the cross-slide, with automatic pickfeed of the table at each reversal, is available which makes the machine capable of producing the entire impression without attention on the part of the operator. A "short-stroke" button permits the operator to reverse the cross-slide as the cutter comes out of the impression on narrow portions of the die. In this way he doesn't have to wait for it to complete the full stroke governed by the widest portion of the die. The automatic feed cycle incorporates automatic modulation of the cross-slide feed rate to suit the angle of rise being traced. This permits selection of the feed rate for effective cutting conditions instead of limiting it to the slow speeds required at the deepest angle of rise to be traced.



Feed rates for both table and cross-slide of the 16-in. vertical Hydro-Tel range from 1 to 25 ipm. Power feeds are controlled by a single directional-control lever in each case with five positions to control feed and rapid traverse in both directions

South Bend Handlever Turret Has Ajdustable Length of Cut



The handlever turret designed for use on 9-in. lathes by the South Bend Lathe Works, 378 East Madison St., South Bend 22, Ind., handles six tools with ⅝-in. diameter shanks.

The turret mounts on the inside ways of the bed in place of the tailstock. The turret slide has a maximum stroke of 3¼ in., with the length of cut at each station regulated by an adjustable setscrew.

The stop mechanism is geared to operate automatically in unison with the indexing of the turret head. The index lock releases at the end of the turret slide's return stroke and indexing is done by hand.

SHEAR-SPEED cut them faster

Here are some of the different types of gears, splines, toothed clutches, etc., which have been cut in production already on the new Michigan SHEAR-SPEED gear shaper—the machine which cuts all teeth on a gear simultaneously (see photo below). With the SHEAR-SPEED, you measure cutting time in seconds instead of minutes.

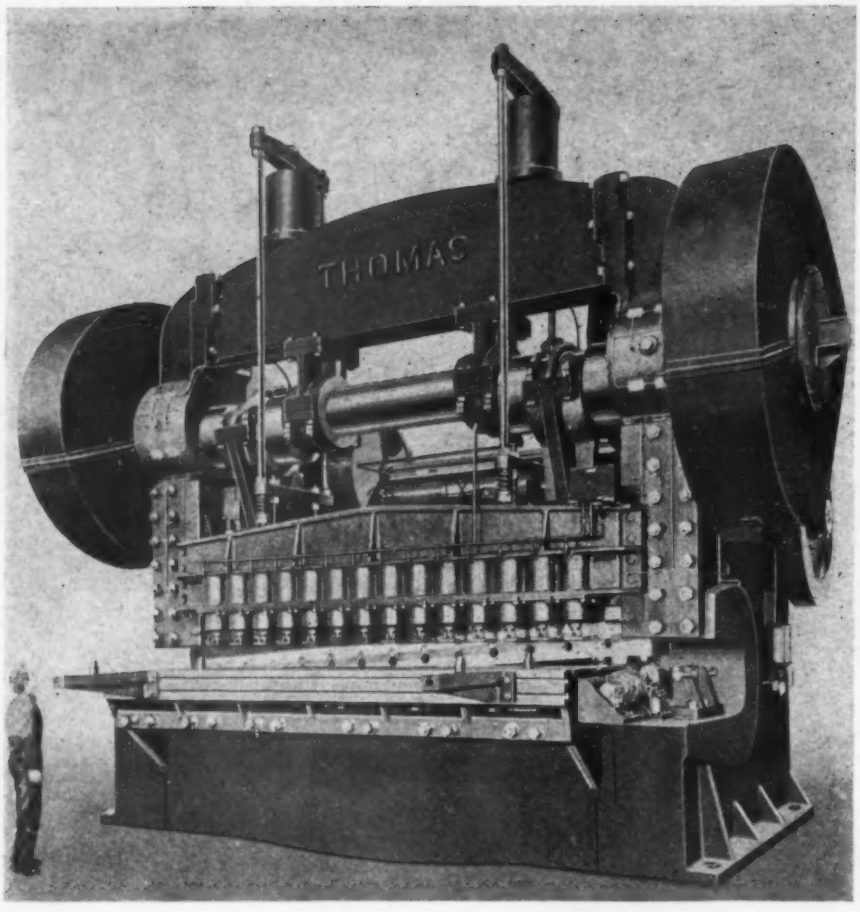
If you want to boost your output of gears per machine hour, it will pay you to investigate what the SHEAR-SPEED can do for you, too.

Write for Bulletin No. 1800-45

ORIGINATORS of GEAR SHAVING

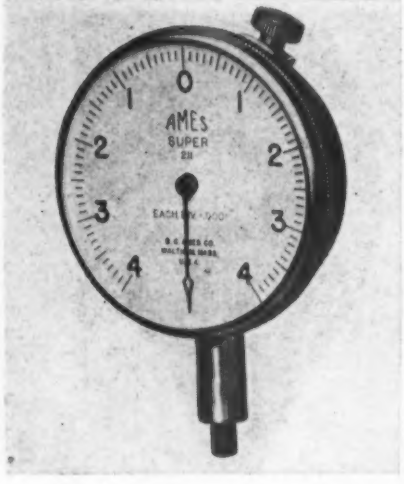
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.



SHEARS—One of an improved line of mill-type plate shears built by Thomas Machine Manufacturing Co., Pittsburgh 23, Pa. Capacities vary up to 3 in. in thickness and 14 ft. in width, or more. This shear has a twin drive on the main shaft to reduce torsion. Other features include herringbone gears, friction clutch, double fly-wheels, and pneumatic counterbalance cylinders

Ames Sensitive Dial Indicators Are Readable to 0.000025 in.

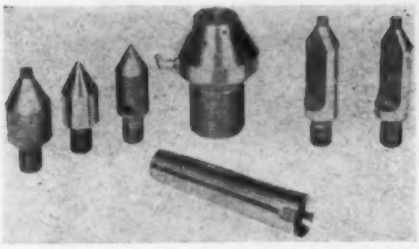


A series of sensitive dial indicators, called "Super," is made by B. C. Ames Co., Waltham 54, Mass. The bezel diameters are 2¼ and 2¾ in. The indicators are graduated in 0.0001 in., with a range of 0.008 in., either balanced or continuous. Low values of internal friction, less than ten grams, and contact pressure (50 grams) are said to result in the indicator following variations in dimensions as small as 0.00001 in. The practical readable accuracy is ¼ of a division or 0.000025 in. The indicators are intended for use as a master check in the toolroom and on the production line. With a diamond contact, it is possible to adapt them for use as surface analyzers.

Black's Machine Centers Use One Shank, Six Assorted Noses

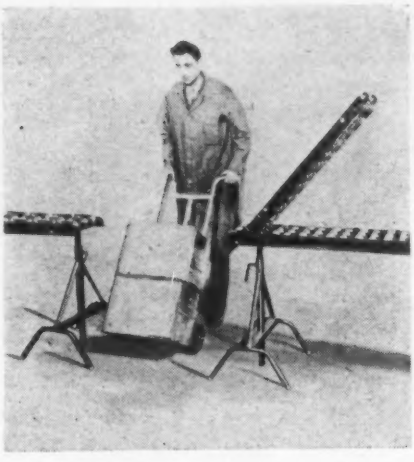
A line of machine centers of patented design is announced by Black Drill Co., Div. of Black Industries, Inc., Cleveland, Ohio.

The set consists of a single shank and an assortment of six noses which thread into the shaft. Once the shank is placed in the spindle it does not have to be removed. Noses can be changed to suit the requirements of the work. The noses are made of high-speed steel heat-treated to Rockwell C 65.



The centers are made in sizes No. 2 to No. 12 for lathes and grinders, with Morse, Brown and Sharpe, and Jarno tapers, and with straight shanks.

Hinged Conveyor Section Bridges Aisles, Swings Up



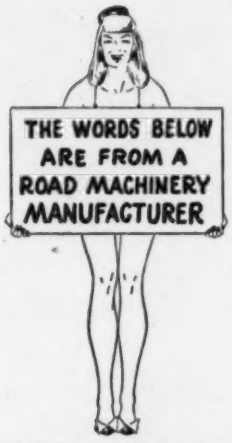
A hinged conveyor section to use in bridging aisle-ways is announced by The Rapids-Standard Co., Inc., Grand Rapids 2, Mich. It provides a 36-in. open passageway.

The hinged section is opened by lifting the movable part, swinging it upward and back until it rests on the stationary section. The hinged section is made as part of a standard 10-ft. section.

DoAll Portable Welding Unit Includes Built-in Grinder

A portable welder designed for production welding of bar and round stock up to 5/16-in. dia., Model DBW-3A, is announced by The DoAll Co., 1301 Washington Ave. S., Minneapolis 4, Minn. The unit has a built-in grinder for weld dressing, automatic motor-controlled feed of material, and cam-operated lever method of clamping which speeds up

WORDS FROM PROMINENT STEELWELD PRESS USERS



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"We installed this press brake approximately a year-and-a-half ago, and the performance of it has exceeded our expectations. This press brake is constantly in use and has saved us considerable money in the fabricating of items used in the products we manufacture. Our only regret is that we did not purchase this machine several years ago. We will be very glad to recommend this brake to anyone requiring a machine of this type."

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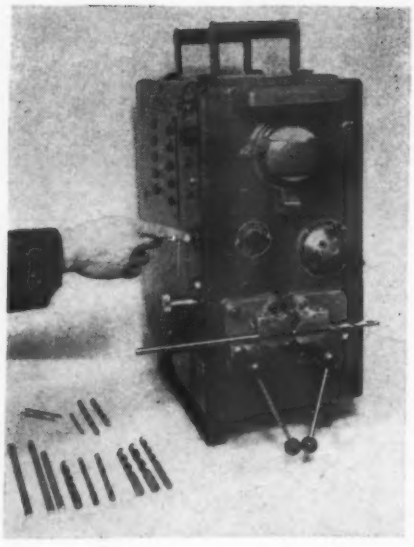


welding. The welding cycle is automatic, and controlled by a single pushbutton.

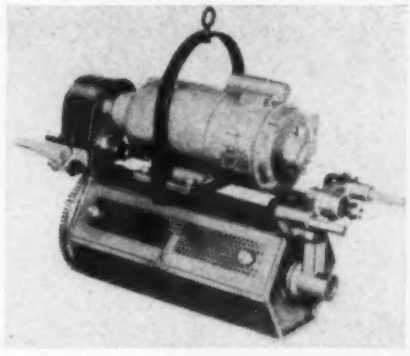
Bandsaw blades from 1/16- to ¼-in. wide can be welded. An etching attachment provides a means of permanently identifying tools, jigs, and other units. It is designed for standard 220 volts, single-phase, 50 to 60-cycle ac. operation.

Boyar-Schultz Adjustable Holder Designed for Drills and Reamers

An adjustable drill and reamer holder made from drop-forged alloy steel is announced by Boyar-Schultz Corporation, 2110 Walnut St., Chicago 12, Ill.

Designed to withstand impact and strain, the holder has hardened and ground mat-surfaces, bore, and shank. The head is made unusually strong which is said to eliminate tool breakage when the setscrew is drawn down tight on the bushings. The holder is available in three sizes: 00, 0, and 2. Either long or short shank is available in 00 and 2 sizes.

Small Quantities Can Be Plated In Mercil Portable Barrel Unit

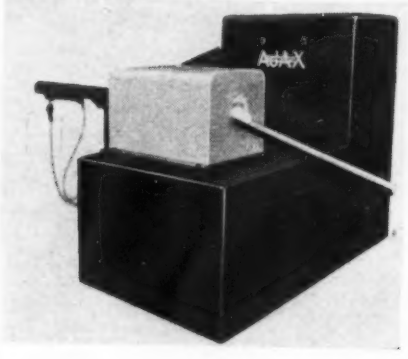


A plating barrel development for small quantities of work, the Mercil Portable Barrel Unit, has been developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. The unit can be furnished with a steel cylinder for cleaning, a Monel cylinder for pickling, or a rubber or Bakelite cylinder for plating.

The apparatus is furnished with special Janette motor-reducer to drive the cylinder at 1.6 rpm. The motor is totally inclosed, mounted on the tierod assembly directly above the cylinder.

When equipped with a steel cylinder, the unit can be used for a tank containing solution for black-oxide finishes. When used for plating the speed reducer is arranged to give a cylinder speed of 5 to 6 rpm. The unit will hold approximately two quarts of work.

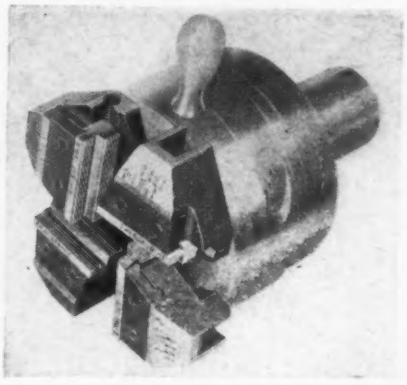
Ajax-Northrup Induction Heater Feeds Steel Slugs Automatically



Continuous, automatic heating of steel slugs or forging blanks is performed in the Ajax-Northrup induction heater made by Ajax Electrothermic Corp., Trenton 5, N. J.

The cold slugs are loaded into a roller-type chute on the left side of the heater, are fed in a continuous succession through the horizontal heating coil by a pneumatic ram, and drop out at the other end of the coil into a chute. Production rate when heating slugs 3⅜-in. dia., 1¾-in. long to 2200 F. is 350 per hr.

Conversion from one job to another is accomplished by changing the heating coil, resetting the timing device, and adjusting the feeding chute.



DOUBLE DIAMETER — This tangential-type ground thread chaser for two diameters is made by Landis Machine Co., Waynesboro, Pa. All surfaces and the thread form are ground after hardening and will hold a class three fit on the two diameters. Threads produced on each diameter must be of the same form and pitch, and should be of fairly short length

Acro Precision Square Shows Error on Indicator Dial

A precision angle square, Micro-Sine, is announced by Acro Tool and Die Works, 4554 Broadway, Chicago 40, Ill. Designed to check right angles and accuracy of work to within 0.0001 in. within a given distance, a standard indicator shows the error on an indicator dial.

Two types are available; one with a standard precision gage reading in tenths, and the other with a lever indicator that reads in thousandths.

FARM COMBINE IN ACTION cutting grain, threshing it, elevating it to hopper bin to be placed in bags and picked up by truck. Many parts of Cold Finished steel are used in both tractors and combines, without which machinery today's great harvests would be impossible.

Experience and proper equipment are indispensable in the production of steels for cold working. At J&L the steel used in cold finishing operations is specially selected to be cold drawn, turned and ground, turned and polished or cold rolled. This is one reason why J&L Cold Finished steel is easy to machine, why you have fewer tool changes when making parts for agricultural implements, automobiles, home appliances and business machines. Write for information.

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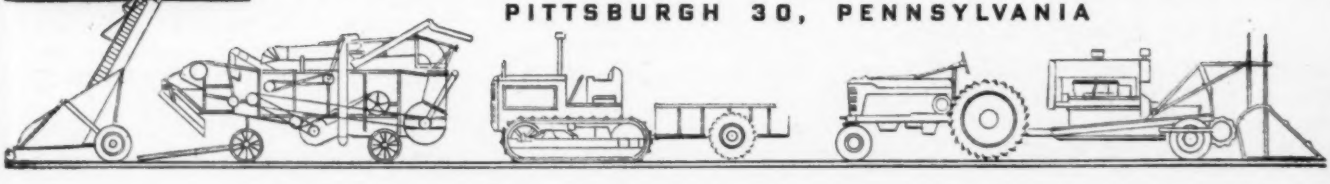


Parts and Materials

Norton 32 Alundum Abrasive Made with Separate Grains

A new aluminum oxide product, 32 Alundum, which produces abrasive grains of improved shape and structure, is announced by the Norton Co., Worcester, Mass. Each grain is a complete, single crystal.

The crystals form individually in a chunky, nubbly shape. The grains are formed in a special electric furnace process in a fluid matrix. They are separated from the matrix without crushing, and are screened into standard grain sizes.

The many plane surfaces form both exterior and re-entrant dihedral angles, which increase the cutting efficiency of the grains. This sharpness is said to give wheels that cut very fast and very cool.

Kennametal K5H for Small Tools Used in Precision Boring Work

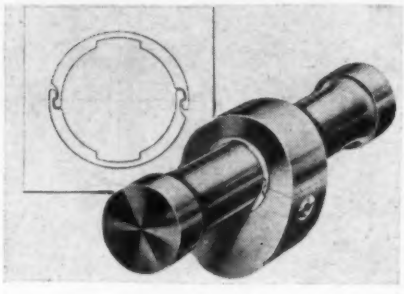
A very hard Kennametal Composition, Grade K5H, for small tools used in precision boring, is announced by Kennametal, Inc., Latrobe, Pa.

The new composition has a Rockwell A hardness of 93.2, great resistance to cratering, and is said to be unusually strong for such a hard material. Solid tools 3/32- to 5/16-in. dia., and 5/32- to 5/16-in. sq. are available, as well as blanks 3/32- to ⅜-in. dia. and 3/16- to 3/8-in. sq.

DuPont Pigment Provides New Shades for Industrial Enamels

Auric Brown, a pigment color announced by E. I. DuPont de Nemours and Co., Inc., Wilmington, Del., is chemically hydrated ferric oxide of small particle size. It offers increased resistance to light for industrial enamels, trim paints, coated papers and possibly plastics. Non-bleeding in the usual paint, enamel and lacquer finishes it also shows no tendency to chalk from outdoor exposure.

No Gap in Truarc Retaining Ring Of Two-part Interlocking Design



A retaining ring of two-part interlocking construction is announced by Waldes Kohinoor, Inc., Long Island City 1, N. Y. Known as the Truarc interlocking ring, type 5107, it forms a complete annular shoulder of uniform section height around the circumference of the shaft, and eliminates the wide gap usually encountered in retaining rings.

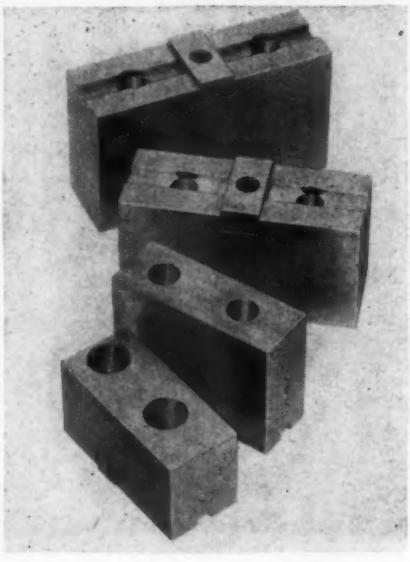
The ring consists of two mating halves and is dynamically balanced. The ring is not lifted from its groove by high centrifugal forces, but can be removed by prying with a screwdriver.

Turco Hot-tank Cleaner Removes Carbon and Paint

A hot-tank cleaner that is said to effectively remove carbon and paint, as well as grime, grease, gums, heat-hardened resins and heavy dirt, from steel and other metals, is announced by Turco Products, Inc., 6135 South Central Ave., Los Angeles, Calif.

Known as Ferrex, the material uses a water solution and a simple hot tank, preferably with air agitation. It is said that the non-flammable solution may be used repeatedly with little depletion of strength.

Jergens Jig and Fixture Parts Include Soft Jaws for Chucks



A complete line of jig and fixture accessory parts is announced by the Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, Ohio.

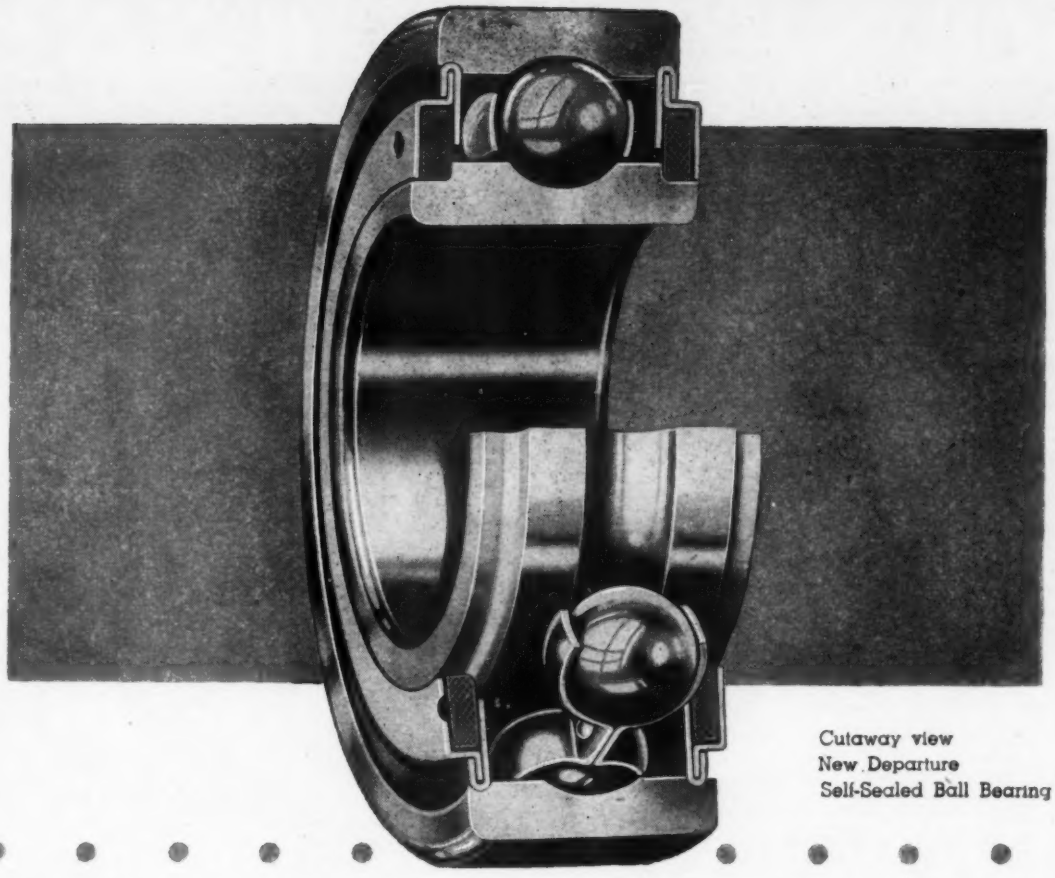
One feature of the line is the soft jaw blanks for key-type scroll and air chucks. The jaws are made to American Standard chuck dimensions. They can be machined to special shapes and case-hardened for first operations.

All items in the line are hardened and black penetrated to prevent rusting while in stock. Threads are protected with "Seal Peel" to assure maintenance of accuracy. Included in the line are quarter-turn screws specially designed with a radius top, flanged and spherical nuts with spherical and plain washers, T-slot bolts and nuts, and clamp shoe assemblies.

Jiffy Co. Scale Drawing Pad Gives Choice of Three Scales

A scale drawing pad which can be used to make properly proportioned drawings in the shop without using drafting board or T-square, is announced by Jiffy Sales Co., 1809 E. 37th St., Cleveland 14, Ohio.

The Jiffy sketch pad contains 75 sheets of tracing tissue in a covered



Cutaway view
New Departure
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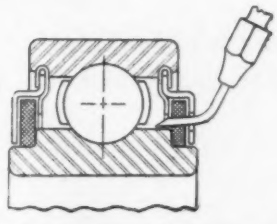
. . . now has a new plus feature

In the majority of applications you can install it —and forget it—because this bearing is, for all normal conditions, *lubricated for life*, with dirt sealed *out* and the lubricant sealed *in*.

But *now*—for the *unusual* applications—where excessive heat or other abnormal circumstances were formerly too tough for a single supply of lubricant, these bearings can be relubricated quickly and easily. There is no removal of seals—no nipples, grease passages or plugs required.

Thus, this one type of New Departure Self-Sealed Ball Bearing gives you dependable performance for *both ordinary* and *unusual* conditions, extending its use to *many additional* applications. New Departure originated the self-sealed bearing. Over 110 million are in successful operation. Ask for informative Booklet IB.



In most applications you never need relubricate a New Departure Self-Sealed Ball Bearing — because it is lubricated-for-life.

When operating under the abnormal conditions described at left, you may, at infrequent intervals, relubricate as follows:

Simply insert the "hypodermic" nozzle of the lubricating gun through small hole in seal member. Nozzle penetrates the flexible inner seal, cleaning itself as it enters. Lubricant is injected and hole in seal closes completely as nozzle is withdrawn. No dirt can get in.

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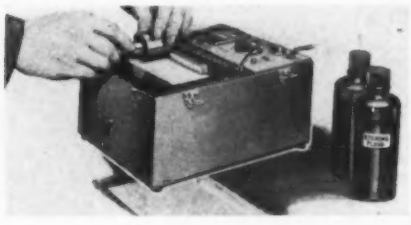
jacket which has four cardboard flaps. Different scales are printed on three of the flaps—one for inches and tenths, one for inches and eights, and one for isometric. The scale desired is placed under the top tissue sheet. Various engineering data is printed on the back of each flap.

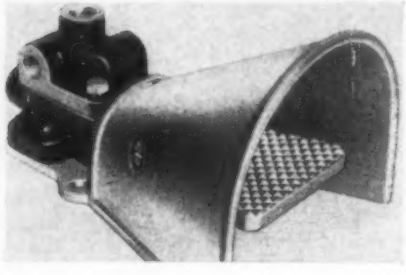
Ideal Production Marking Unit Marks Metals in 1 to 3 Sec.



A device for production marking, the E-Z Mark Etcher, is announced by Ideal Industries, Inc., 1057 Park Ave., Sycamore, Ill. Through use of a film stencil, most metals can be marked in one to three seconds. Work with round or flat surfaces can be marked. Impressions are made on the stencil with typewriter, pen, pencil, or stylus.

No acids are used in the etching fluids. Depth of markings is controlled by a rheostat and time of exposure.

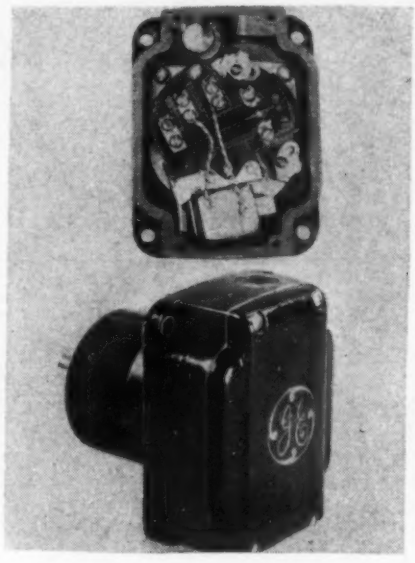
National Pneumatic's Foot Valve Shielded to Avoid Accidental Use



A universal-type, foot-operated valve for controlling compressed-air cylinders is made by National Pneumatic Co., Rahway, N. J. The valve can be arranged to apply pressure with the pedal depressed or with the pedal released.

The pedal is shielded to prevent accidental operation. The pedal cannot stick in a downward position, since it is returned to its upward position by the operating air pressure in the valve. Outside dimensions of the valve are 7⅛-in. deep, 5½-in. wide, 4¼-in. high.

GE Oiltight Plugging Switches Prevent Restarting in Reverse

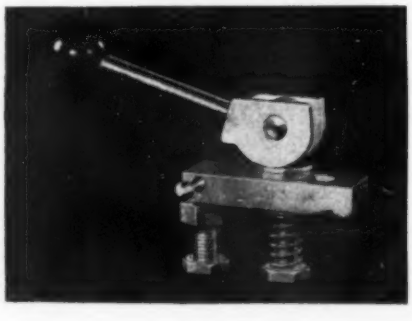


A line of oiltight, dustproof plugging switches for flange and surface mounting is announced by Control Div., General Electric Co., Schenectady, N. Y. The switches are designed to remove plugging power from a motor at the correct moment, to keep the motor from restarting in the reverse direction. The flange-mounted form is for built-in applications, while the surface-mounted type is for general-purpose use.

A lockout device can be provided which releases the lockout latch and permits normal operation of the switch when the motor is connected to the line. On applications which require "turning over" the driven machine by hand, the lockout device protects the operator by acting as a guard against accidental starting.

West Point Co. Fixture Clamps Compensate for Work Variation

A series of five Wespo fixture clamps for holding work is announced by West Point Mfg. Co., Farmington, Mich. The clamps have ground stud



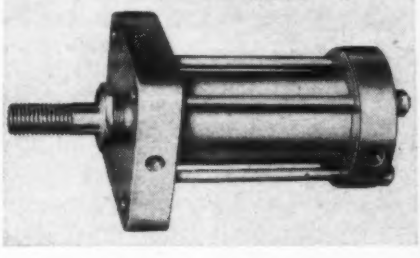
washers with ground spherical radii, allowing the clamps to float and compensate for irregularities in the work.

The clamps are made of heat-treated alloy steel, cadmium plated. The five types for different clamping methods include quick-action clamps, one of which is illustrated. Each type is made in six sizes. Scale templet drawings of each type and size are available to aid in specifying the right clamp in a particular fixture design.

Balls Made of Tungsten Carbide Used for Burnishing, Polishing

Precision balls made of tungsten carbide for use in burnishing and polishing operations are announced by Industrial Tectonics, Ann Arbor, Mich.

Their hardness in combination with corrosion resistance, makes them useful for check valves and other applications. They are made in any size with any desired degree of dimensional accuracy. They can be furnished with a hole.



AIR CYLINDERS—New line of air cylinders made by Oakland Engineering Co., Inc., 800 100th Ave., Oakland, Calif., have drilled mounting holes. Shouldered piston rods hold the pistons square with the cylinder walls. Piston glands are made of bronze. Oil and moisture proof leather cups are standard, with asbestos molded cups for special application

White & Bagley's No. 1888 Is Water-Soluble Lubricant

A liquid-type, water-soluble lubricant called Economy Lubricant No. 1888, is announced by White & Bagley Co., Worcester, Mass. The lubricant is said to present unusual detergent properties and may be used for both grinding and cutting operations.

The lubricant is said to be easy to mix and to provide excellent rust protection.

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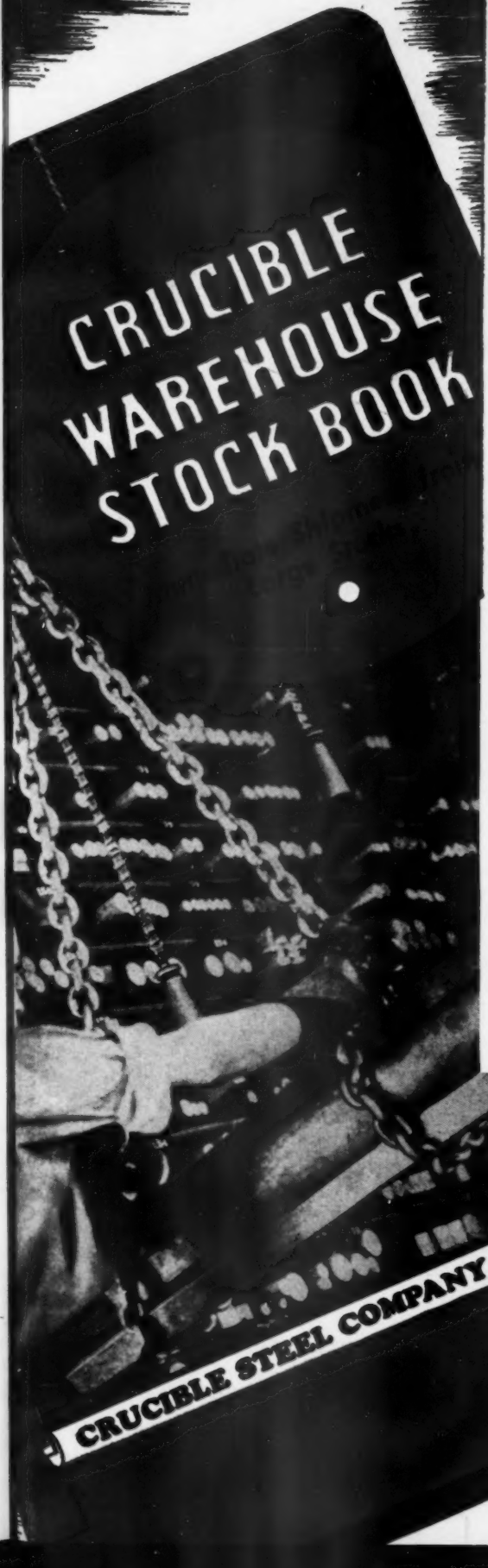

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WORK: Reaming hole 4½" in depth in 4130 steel—Rockwell C Hardness 41 to 43—on a radial drill.

TOOLS: 1. H.S.S. Reamer was used first and could not do the job satisfactorily.
2. Wendt-Sonis Carbide Reamer.

SPEED: 450 to 500 rpm.

FEED: .010.

RESULTS: 900 holes on 51 regrinds to average 18 holes between grinds.

Unretouched photograph of W-S carbide tipped spiral flute reamer. Still useable as long as carbide is left in flutes.

PERFORMANCE RECORDS like the one described above are ample proof that Wendt-Sonis Reamers help increase production . . . decrease costs. And, new developments continue to lengthen the service life of these reamers. Wendt-Sonis carbide-tipped reamers are made in a wide variety of sizes and styles — designed by one of the pioneers in the carbide tool field.

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ROUND TABLE Discussion

TO BE OR NOT TO BE YOUR OWN BOSS

It is an age-old question that Al and Ed were discussing but surely those who seek safety—first, last, and all the time—are not of the boss type. It is the observant men who take intelligent risks who become bosses, not because they take a pleasure in bossing but because they are leaders. It will have been from their ranks that Columbus, Watt, Stephenson, Edison, Henry Ford, the Wright Bros. came, to mention but a few—men with vision.

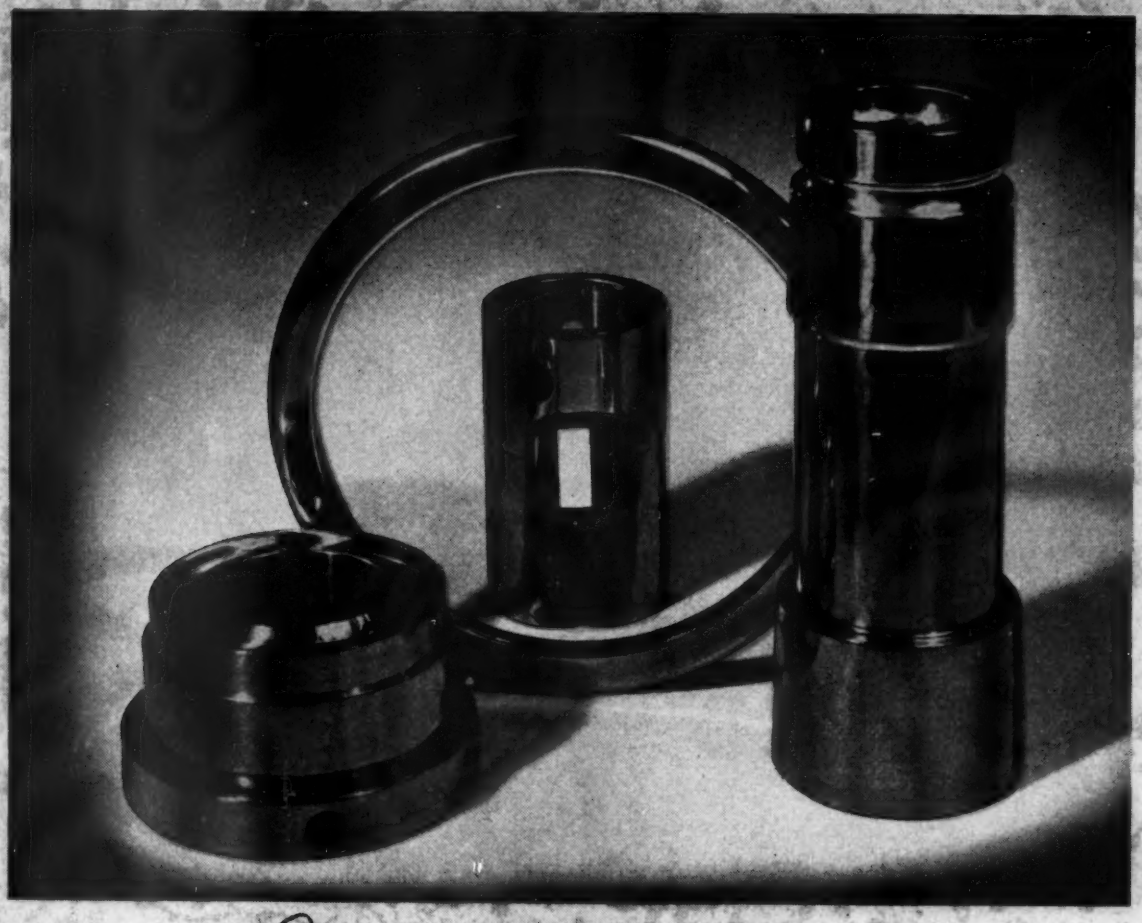
An essential need is to have something to make for which there is a demand; another is to know how to make it; and a third is to be able to sell it when made. All these call for leadership. Leadership connotes ability to get things done—to manage. True there are other needs but these are less likely to cause trouble than the lack of those mentioned.

Some men fail in business because they had no business to do; no service to render other than trying to share the other fellow's bit. If in trying to do this, they can beat him at his own game, by supplying a better article or one equally good at a lower but fair price, a service will have been rendered. If not, failure is likely.

A notable example of the need for the knowledge of "how-to-make" is the airplane industry in England. Early manufacturers knew something of the laws of flight but nothing of those governing production. The consequence was that production was not intelligently controlled; the bosses were led instead of leading and if it had not been for the world's hunger for the means to fly, irrespective of cost, the resultant obvious inefficiency, with its extraordinarily high costs of production, would have spelled ruin to the industry.

It was said of the founder of one of London's large stores that before deciding upon its site, he stood all day to count the number of people who passed by. Feeling sure he had something he could sell, he made certain of his possible customers and then built his store. He did not fail.

Has it not been said, that if the best shirt maker in the world buried



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himself in the heart of a forest, there would soon be a beaten track to his door. Service is the key-note of success and he, who really supplies a need, serves, leads and is boss. Men of the Ed type should just paddle their own canoe; it is so much safer and their dough, limited in size, perhaps, will come in regularly as long as they have jobs. Does Ed feel sure he has a job for life? I wonder if anyone is sure. Would he prefer to be an out-of-work boss or mechanic? Life is hard.

J. Ellward
Kent, England

•

DO MACHINES MAKE JOBS OR TAKE THEM?

The immediate result in using higher-production machinery is of course less physical work, or production work in the plant installing it. If the plant supplies a constant demand for its product, a machine doing a certain operation "X" times faster than one or more men, but only needing one operator, will not only cause the demand to be filled sooner, requiring less hours of work, but certainly make necessary a smaller labor force. These displaced workers would have to be transferred to other parts of the factory, speeding other operations, or fired.

Under the system of economics in our country, or possibly any country, the workers couldn't be transferred to the factory making the machines which caused their jobs apparently to disappear into thin air.

So obviously, work, or employment is taken from one man and given to another. This is not pointless. It is elimination or reduction of an inefficient process, resulting in a lower-cost product. Even the displaced worker will not want to go back to using a hand screwdriver, taking 5 min. to do a job, when the power-driver will do the same thing in 30 sec.

Would this man rather see a bulldozer level the ground for his home in 2 hr. at $4 an hr., or a dozen men at $1 an hr. working 8 hr., moving these tons of earth, doing this heavy physical, back-breaking work? Who could afford the costs of this inefficiency?

This displacement of workers is painful to the local area but it benefits the unit as a whole. The apparent parallel case is the surgical operation where the pain in its immediate location is only deadened by the anesthetic, and, in the long run, the body is helped. In our

HE'S LOOKING FOR BUGS

HE's hoping, of course, that he doesn't find any. Because in the manufacture of files, the best way to keep out "bugs" (defects) is to keep looking for them. Nicholson inspectors do that endlessly—through scores of inspections, tests and precautions. They begin with the scrutinizing of every batch of steel and continue down to the "ringing" test for soundness and a final check on the appearance of every finished Nicholson or Black Diamond file.

The inspection pictured above is a "spot" examination, through a hand magnifying glass, of a file that has just come from the cutting machine. Its purpose is to make sure that the file's teeth are properly raised and correct in shape for the kind of filing job they are to do.

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deliveries?

A highly efficient inter-departmental follow-up system enables us to steadily maintain an unusually high percentage of delivery promises.

range of products?

We produce Helical Gears, Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Spur Gears and Ground Thread Worms in the following materials: Cast Iron, Steel, Bronze, Brass, Aluminum, Stainless Steel, Cast Alloys, Monel Metal and Non-Metallic Compounds or Compositions.

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PERKINS Precision, Custom-Cut GEARS

PERKINS MACHINE & GEAR CO., Springfield 2, Mass.

case, the "anesthetic" could take the form of an educational program and a guarantee of some kind of employment or income (we do have unemployment compensation) thus removing some of the fears of insecurity, which cause the "slowdowns" and limited production rates when these incidents occur. These show ignorance and a misunderstanding of the benefits of increased efficiency of production to mankind as a whole.

The most powerful argument in favor of any labor-saving machinery is that it takes monotonous, physical efforts from human beings. But no machine can ever do the work of the human mind or create original thought. Labor-saving devices, while distributing work, lower both production and consumer costs, also distribute wealth and earning power, causing an increase in production necessary to supply widening needs, though these benefits do not make themselves evident immediately.

Edward Diskavich
Torrington, Conn.

•

ARE FOREMEN'S MEETINGS PROFITABLE?

Regular meetings of foremen are a decided asset to any firm, as it is a means of welding the whole of the executive into a team working to a common end. Also, there are problems which have varying aspects, and often if any one particular foreman is approached for his suggestions, he only considers his own point of view, whereas in the presence of his colleagues all aspects can be examined and a policy best suited to the interest of the firm involved.

Particularly is this true in the case of a plant having its own foundry and forge shops and where new designs are periodically introduced. In this connection, I know of a firm where the senior foremen meet the works manager each week to discuss production and relative problems, and where representatives of various other branches of the organization come when there is any matter on which a considered opinion is required.

For example, the chief designer and draftsman responsible bring along the rough draft of a new machine and state the requirements from their point of view. The various foremen then make constructive criticism of the various details as regards methods of manufacture. Then a design is evolved satisfactory to the service requirements and also consisting of components best

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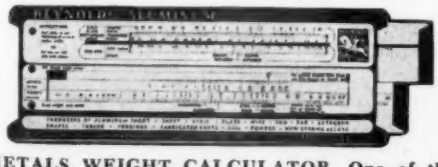

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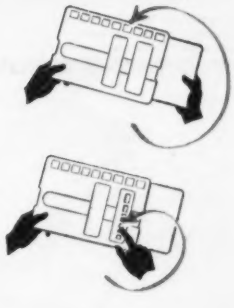

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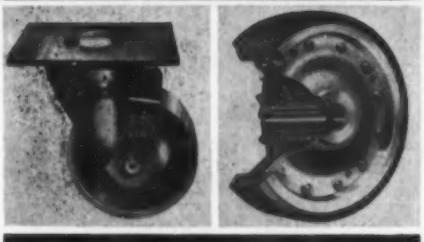

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suited for manufacture by the plant available. Here, too, the relative claims of foundry, forge and machine shop can be discussed and methods of holding work and machinery allowances desirable, decided upon.

From personal experience of such meetings, I would say without hesitation that they are both profitable and desirable, and they do decidedly help morale and most certainly tend to avoid mistakes and misunderstandings.

H. R. Thomas
Cornwall, England

•

IS IT SAFE TO GIVE CREDIT WHERE IT'S DUE?

Unfortunately, people are not all alike and so a uniform procedure for handling them cannot be established. Ed may be right that some people would use a pat on the back as a lever to obtain a raise in wages, but isn't it a fact that we have chiselers in all walks of life, people who will take advantage of everything and everybody to obtain personal gains?"

If the foreman is sincere in what he says, a compliment to a worker goes a long way to promote harmony between worker and management. A worker usually knows when he has performed a good job, and this in itself gives him a certain amount of pleasure and self-satisfaction. If in addition, the foreman compliments him on his performance, good relations are sure to follow.

There are many instances in a worker's daily routine when he must depend on his own initiative and make many minor decisions, especially in the higher skilled trades. If a foreman compliments his workers when they have made good decisions they gain more confidence in themselves and become more efficient and are of more value to the foreman and the company they work for.

If they have committed an error in judgment, the foreman should be patient enough to explain where they have erred rather than fly off the handle. If, on the other hand, a foreman never gives compliments but is always ready to "bawl out" his workers, they will lose their confidence and bother him about every detail, because they are afraid to take a chance.

To most workers, the foreman means management. The treatment they receive from him goes a long way in formulating good or bad employee and public relations. Many people feel that better relations between foreman and worker would have prevented many of our work stoppages in the past year, a factor which should not be overlooked at this time when every one is clamoring for the products that our workers are manufacturing.

Robert Knotek
University Hts., O.

•

EQUAL PAY FOR EQUAL WORK?

There are many factors that enter into the subject of equal pay for equal work. The principal ones follow: Time consumed on the job not only affects the employer by cost of the operators' wages and overhead cost of the machine tool, but also the cost of the foreman's time used in instructing and watching a slower and less-skilled operator. It is safe to say that the foreman finds it necessary to spend the major part of his time with the least-skilled operators.

Quality of the work performed affects the reputation of the shop and also determines whether the customer is satisfied or displeased with the product.

Ed did wisely in placing the man with a sour disposition in a place where he would not disturb others, but it isn't hardly fair to withhold from him what he has justly earned for his employer. Workmen should be compensated in proportion to their value to an employer by a bonus in addition to their standard wages.

This should not be done secretly, as is sometimes done, because it generally leaks out. The bonus should be determined by a carefully selected committee of at least three men, who should give due consideration to all factors pertaining to the job.

Martin H. Ball
Watervliet, N. Y.

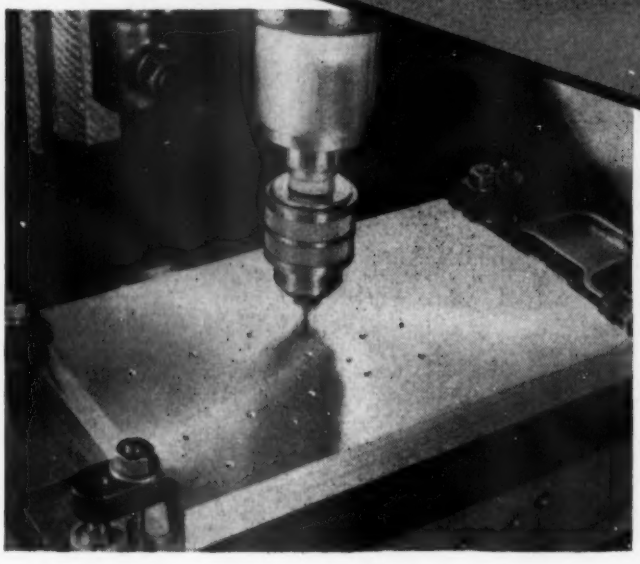
•

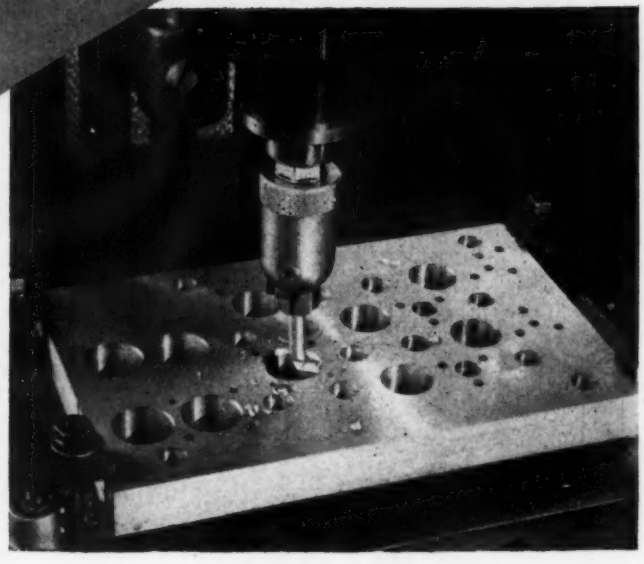
OLD MAN JONAS LOOKS ON

Looking back over a period of 30 years' experience in machine shops, I can see where Old Jonas has occasion to feel irritated with the type of executive who puts his trust in conferences instead of getting out in the shop and finding out first-hand what is causing the production bottleneck, even to the extent of getting some grease under his fingernails.

Some of the finest executives I have known were men who used both the conference approach to production as well as the direct action of getting down in the shop and tackling a balky machine or

HOW TO OBTAIN *increased speed* AND *closer tolerances* IN JIG BORING





NO S-T-O-P and S-T-A-R-T TO CHANGE TOOLS AT EACH HOLE

In the Moore Jig Borer you can *consecutively* spot, drill, bore and ream *all* holes in the work-piece with minimum tool changes. In other words, you don't have to change tools at individual holes for each operation, because there are no size blocks or end measures to labor over.

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The Moore Jig Borer is ideally suited for jigs, fixtures, dies, special machine parts and jig-less, small-lot production. It is highly sensitive for holes 1/32″ diameter, yet rugged for heavy cuts up to 4½″.

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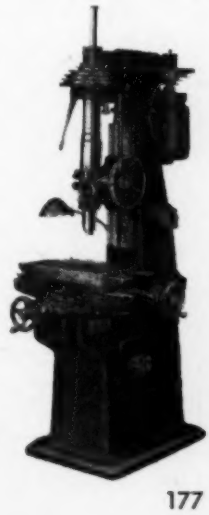

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group of machines that threatened to upset the flow of production that had been planned in conference. These men did not "lose face" by mingling with the men in overalls—on the contrary they gained in stature.

On the question of cost and rate-setting, it has been my experience that the man with actual machine-shop experience is more likely to have the confidence of the men in the shop when it comes to taking time-studies and setting rates than the college type whose knowledge of actual machine work is in most cases limited. I know several prominent machine-tool concerns whose time-study departments are staffed entirely by men who have graduated from the machinist-apprentice course of their own company.

Naturally, these men know the company's product and the machine operations that are required to make them and are better equipped to make a study than an "outsider" whose training has been more on the theoretical side. Not that the college man hasn't his place in the machine shop—far from it—the slide rule and graph boys come into their own when it comes to motion study, statistical control, advertising and publicity.

To sum up, the conference is a valuable tool in coordinating the various departments and explaining the over-all plans of management, but it is not a production cureall. The wise superintendent will find time to do a little leg-work in the course of his day to make the rounds of the various departments and see for himself how things are progressing instead of scanning reports that sometimes do not convey all the facts.

Incidentally, the daily visit is a good thing for the morale of department heads and employees, it keeps them on their toes in the matter of plant housekeeping, sometimes allowed to slip when the "Big Boss" makes infrequent visits.

Robert S. Alexander
East Providence, R. I.

SEEN and HEARD

By John R. Godfrey

New Engines Recall Past

THE COMING of the all-steel engine for automobile work, together with the cast-aluminum engine of Jack & Heintz, seem to be part of the modern trend. But to us old-timers they recall days of long ago. Soon after World War I, the Van Bleck Company made gasoline engines of steel in Monroe, Mich., that were interesting examples of pressed-steel work The connecting rods were an especially nice job of sheet-steel work. The engines were never fully accepted, although I think some of them were used in marine work.

On the aluminum side, the laboratory of the Aluminum Company in Cleveland did some interesting experimenting at about the same time. They made some cylinders for Franklin of aluminum castings and plated the bore with cast iron. They also made camshafts and even tackled a crankshaft, plating the bearings in both cases, and the cam as well. Ralph Carpenter, who is now with the Spicer Company, and Joe Armitage of Kearney & Trecker, were both in Cleveland at the time and had a hand in this work. Franklin used aluminum connecting rods for a number of years. They reduced the reciprocating weight to an appreciable extent.

•

Profit-Sharing

BURNHAM FINNEY'S study of profit-sharing is illuminating in many ways. The seven objections of labor are interesting and to the point. They should be studied carefully by all who are interested. Jim Lincoln's plan for distributing profits has worked well for several years, whether you call it profit-sharing or bonus. It gets a share of the earnings into the hands of the workers just the same.

The Nunn-Bush plan of having 20% of the gross income go to workers is unique and has worked well. This makes the weekly wage a "drawing account," the same as salesmen on commission receive. The surplus, if any, is paid at stated intervals. One feature is the insistence by the company of having its books audited by accountants *paid for by the workers*. This makes for confidence in management's desire for fair play.

One weak spot in all profit-sharing plans is that profits and losses depend fully as much on labor as on management. Efficient management may be stymied by lower production than the equipment warrants. Efficient labor cannot offset poor top management which can lose a lot of money by guessing wrong on when to buy material, what lines of product to push, and in many other ways. And the best of management and the most effi-

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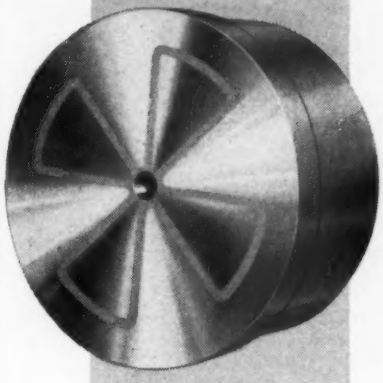

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Whatever the size, shape or material of the work to be held, there's a Taft-Peirce SUPERPOWER Magnetic Chuck to do your job with greater holding power — over a greater working area — than other chucks of equivalent dimensions. SUPERPOWER Chucks deliver a heavier concentration of flux at the face-plate, making possible greater versatility of set-up on grinders, planers, millers, lathes, shapers. And they are equally useful in non-machine applications, wherever ferrous materials must be firmly held. This page shows you a few of the many SUPERPOWER models. For the complete line, write for a copy of the new illustrated bulletin.

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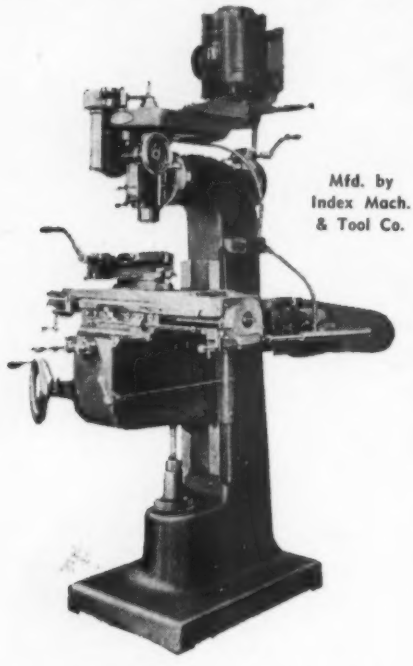
INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

cient labor do not always prevent a concern from going into the red.

Success in profit sharing, as in any plan for harmonious relations, depends largely on mutual understanding and confidence. The larger the concern, the harder this is to attain. Personal contacts between the real managers and the workers are not easy in a big concern. And even well-intentioned "little brass hats" too often lack the experience as well as the confidence of the men.

As with suggestion systems, profit-sharing should not be considered unless management is prepared to go "whole hog" and devote the necessary time and intelligent supervision to make it work. Neither will run itself. Both can be successful when management feels they are worth the cost of constant, high-grade supervision.

•

Another Slant on Profit-Sharing

"YOU KNOW GODFREY, there are more angles to this profit-sharing game than most of us think about." 'Twas Tom Johnson, of course. He'd been reading Chief Editor Burnham Finney's fact-finding outburst in a special report recently. "Finney sized up a lot of 'em in good shape, especially in his seven reasons why they don't work. But that ain't all by a long shot.

"When we make money it's because the men do good work plus the good judgment on the part of young Tom and the rest. If we all did a better job, we'd probably make more money. When we go into the red it may be because the men laid down on the job or we go haywire in the upper office, or both.

"But just 'spose we never went in the red. What part of the profit belongs to who?

"You remember the France Motor Company that went broke some years ago? They built a good car and needn't have gone bust if the big boss hadn't played hog and pulled out an ungodly salary. Shop costs were very low considering the small number of cars they built. But the company couldn't stand a drain like that and it didn't leave but dern little for the stockholders either. Profit-sharing in that shop would have been a joke that the men wouldn't have appreciated at all.

"Then take the Blank Nut Company which has had about as poor management as you can imagine since old man Blank cashed in. Most of the old crew stuck by the ship but the management has been punk. Profit-sharing wouldn't have given the men more than a thin dime in spite of the good work they did.

"Before you can make profit-sharing work as it should, we've got to do a lot of things us old time bosses won't like a bit. If you were in the shop, Godfrey, would you be all pepped up to get a small hunk of the profits as reckoned *after* all the brass hats had taken salaries many times larger than we pay the President of this old U. S. A.? With the boss's sporty son drawing down $1000 a week as one of a dozen V. P.'s without really earning more than the sweeper, and all this being counted out before the auditors began to even think about profits, how can even a good foreman begin to get a fair share of real profits?

"We've been talking a lot about job evaluation, which is a high-toned way of saying how much a man is worth. But until we slap the same yardstick on the brass hats as we do on the G.I.'s, the talk of profit-sharing isn't what it is cracked up to be. If my present job was 'evaluated' in the same way, I hate to think what it would do to my monthly check. The chances are that what I get ought to come out of a pension fund anyhow. I'm not going to admit, even to you, Godfrey, that I've outlived my usefulness. But my real earnings for the company were made years ago and I think I might deserve some decent pension on that account.

"If I was working in the shop and you talked profit-sharing to me, I might ask several questions you probably wouldn't like. I might want to know why all hands didn't have a moderate 'drawing account' based on what we agreed was a fair return for the work they did. I might even be so brash as to suggest that we ought to have a ratio between the lowest wage and the highest salaries paid to the big boss upstairs. I might suggest that a 50 to 1 ratio looked very liberal to me as a spread between Mike, the sweeper, and the grand mogul who sports a flossy office and three secretaries.

"If Mike got $20 a week, the big boss couldn't draw over $1,000 a week. This ought to keep him and his family in groceries for some time. Then there would be more chance of there being something to divide among the stockholders and workers with a profit-sharing scheme. On the basis that the

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INTERNAL GROOVING TOOL

Its versatility saves costly preparation time—provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time—and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO., WORCESTER 3, MASS.

salary represents the man's worth, his share of the profits would be prorated on the same basis. The old man would draw 50 times as much profit as the sweeper, not counting the dividends on his stock. This on the basis that the salary of all had been evaluated and each was getting what he really earned.

"The ownership of stock adds another joker in the deck. The wad of stock which the boss presumably owns gives him another advantage, especially if this is dealt out before they count profits to be distributed, for probably Mike hasn't any stock. Then we have the question of what is a fair dividend. Of course we all like 'em fat, but that isn't the answer.

"The company uses the stockholders' money as a tool in the business. But how much is this tool worth? Two percent or ten? If the money was not invested at all, it would be a liability instead of an asset as you'd have to pay vault rental in a bank where it wouldn't earn anything. Invested, you stand a chance of losing it if the management goes sour. So how much should it earn and should dividends be paid before you begin counting profits to divide with the workers? Does the men's investment in skilled labor come in the same class as a cash investment? What do you think?"

NEW BOOKS

CONCEPT OF THE CORPORATION—*By Peter F. Drucker. 297 pp. Published by John Day Co., Inc., New York. Price $3.*

Mr. Drucker had the unique opportunity of having access for two years to all the activities of General Motors Corporation and virtually living within its walls. He studied at first hand its strength and its weaknesses, as typical of what happens or can happen to any large corporation. He applied himself to many subjects: internal organization, how the corporation trains its leaders, the yardsticks by which it measures its successes and failures, industrial relations, foremen and their responsibilities, the "curse of bigness," wages and productive efficiency, production for profit and for use. He was not subjected to any censorship and was not obligated to write kindly about General Motors. The results of his two-year experience and the facts and figures which he gathered were distilled into the pages of this modest volume. Mr. Drucker, who has written several books and is a regular contributor to national magazines, comes to the conclusion that there are five pillars on which an economic policy for a free-enterprise society rests. These pillars are described in his final chapter. Mr. Drucker has written a book quite different from most books and one deserving the close attention of all students of our modern economic and national life.

•

ARSENAL OF DEMOCRACY—*By Donald M. Nelson. 439 pp. Published by Harcourt, Brace & Co., New York. Price $4.*

Donald Nelson, who was in a key spot as chairman of the War Production Board to observe our war-production effort and who had been in on our defense program from the beginning as one of the top executives, gives in this volume a vivid account, written in the first person, of what happened. He traces the events from the time that he first visited President Roosevelt down through the war years and through the early stages of reconversion. The volume ends with a description of the author's journey to China as the President's special representative and his adventures there in dealing with the Generalissimo. The book is not without its controversial side. Military leaders already have objected to some of Mr. Nelson's statements regarding their desires to take over and run the country during the war. The reader gets an insight into the many facets of war production and how the various vexing problems finally were resolved in victory. Through the pages run personalities who have made history, from Mr. Roosevelt to General Somervell, who led the Army Service of Supplies in its opposition to the policies of the War Production Board.

•

THE INDUSTRY-ORDNANCE TEAM—*By Lieut.-Gen. Levin H. Campbell, Jr. 461 pp. Published by Whittlesey House, New York. Price $5.*

The Chief of Ordnance, United State Army, during most of World War II, has told within the pages of this book the complete story of how the country's ordnance-making resources were mobilized and how the Ordnance Department and American industry cooperated to turn out the weapons needed for victory. No

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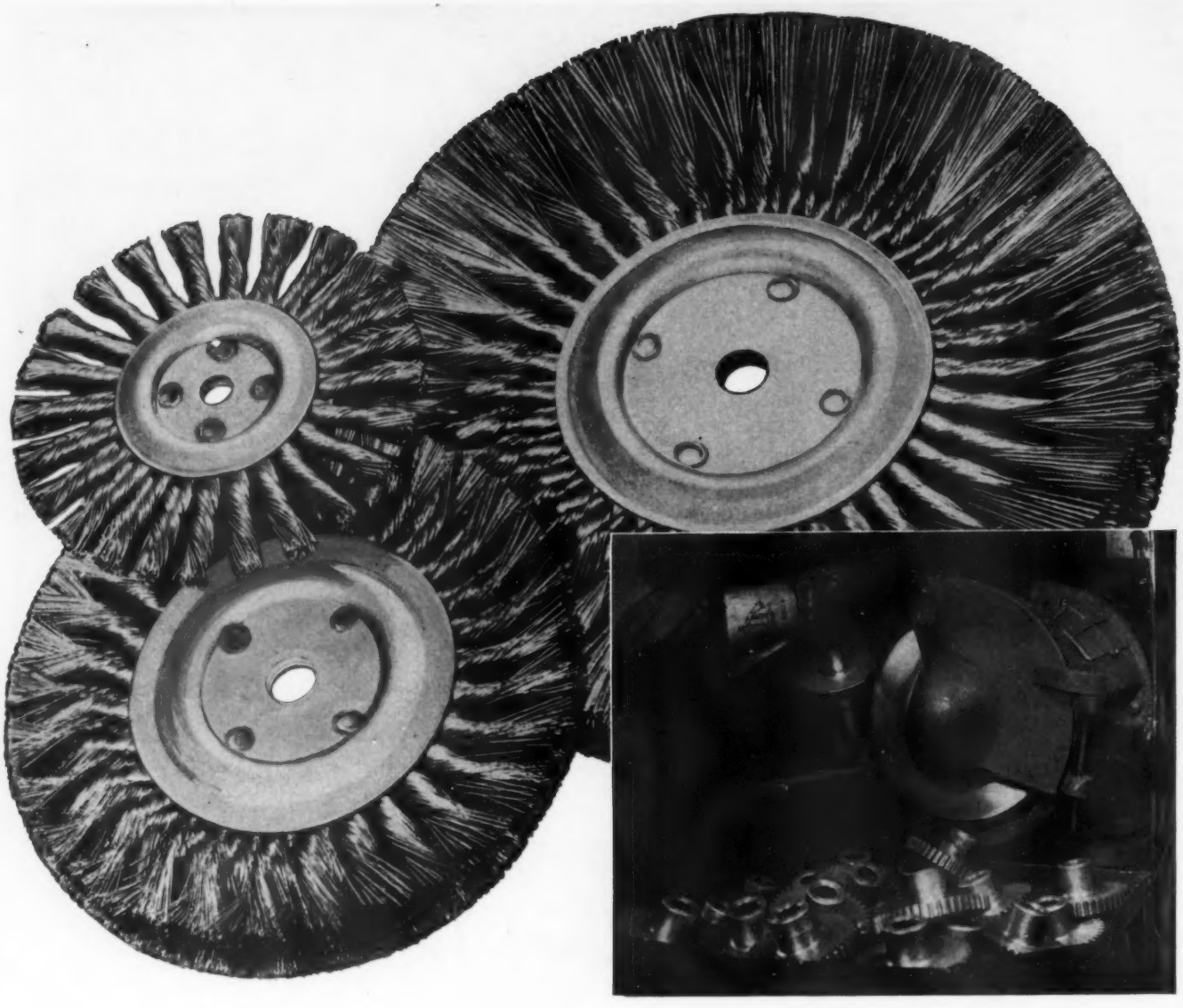

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phase of ordnance activity is overlooked, from production of small arms and tanks to spare parts. From an explanation of the setup at the beginning right through to contract renegotiation and termination the author proceeds with interesting facts and figures.

General Campbell expresses the hope that the basic postwar organization change in ordnance "will consist of a rigorous excision and extirpation of every last malingering vestige of functionalism and the substitution of a commodity type of operation" (such as an Artillery Division). He believes that Army Ordnance and private industry must continue to work closely together and that reliance in a crisis must be put again on private industry's ability to make and deliver the goods. The story told by General Campbell constitutes a well-documented record of the problem of the Ordnace Department and how they were licked. It is an "inside" story which should be of particular interest to those who had any part in it. To the lay reader it also is a never-dull chronicle of the biggest single production job done by any organization during the conflict against the Nazis and the Japanese.

•

THE INDUSTRIAL REPUBLIC—*By P. W. Litchfield, Chairman of the Board, Goodyear Tire & Rubber Co. 201 pp. $4.*

Views, mostly about the relationship of labor and management gained through a half century of industrial experience, are presented in this beautifully printed and illustrated volume. The book is unusual in that it first reprints, as one of its four sections, a book on the same subject written in 1919. In this book the author advocated an employee represenation plan which operated as the Goodyear Industrial Assembly until the Wagner Act forbade its further operation. In the second section Mr. Litchfield analyzes the Assembly in the light of experience. The third section is devoted to the impact of modern unionism which resulted in a violent period in Akron's history. A plan for industrial democracy in America is outlined in the fourth section, which also contains a discussion of wages, profits, taxes, government controls and methods of communistic and fascistic dictatorships. Mr. Litchfield concludes that America's labor problem will be solved satisfactorily only when labor, capital and consumer, representing the three branches of the nation's industrial economy, are brought into balance and harmony.

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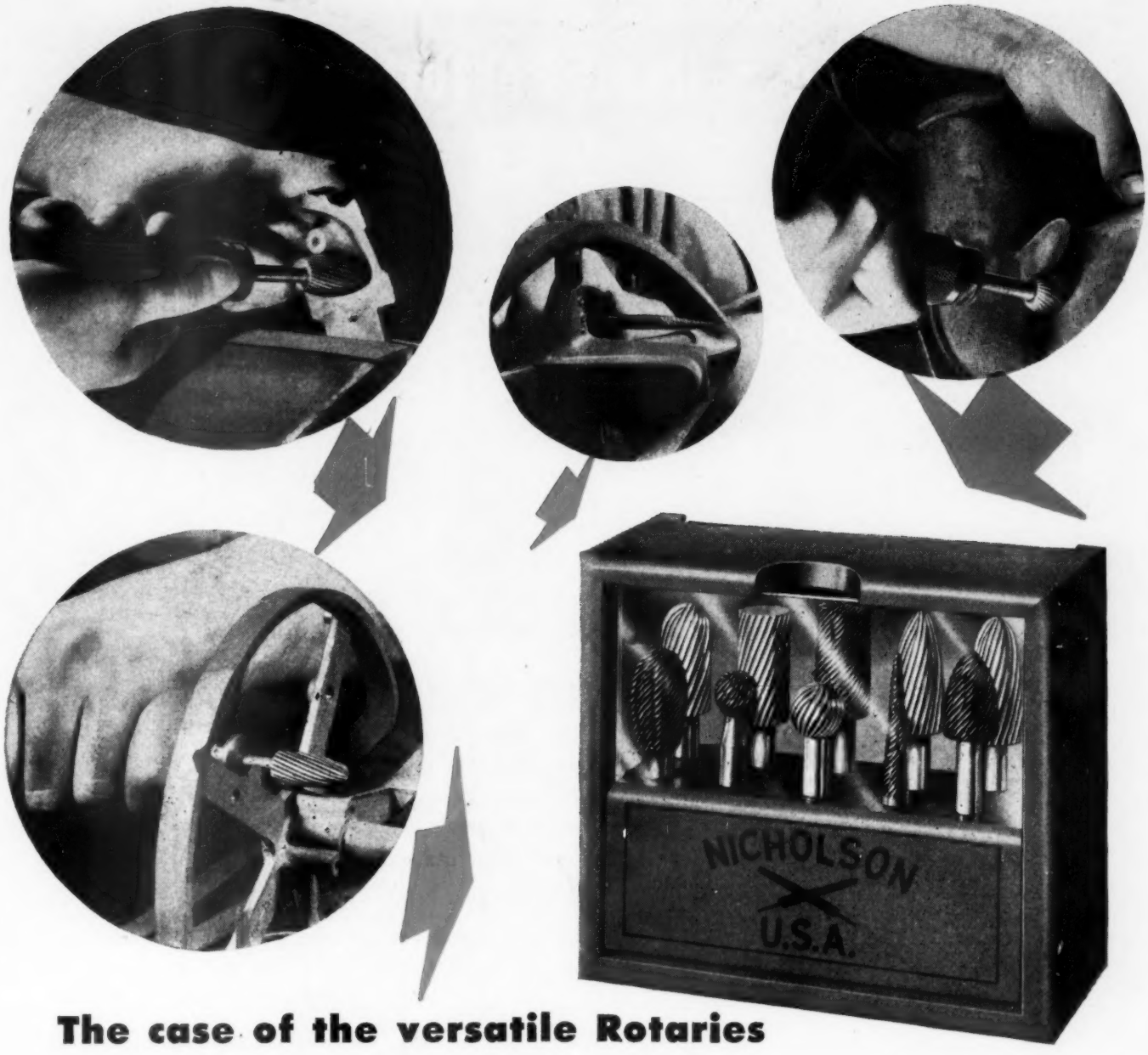

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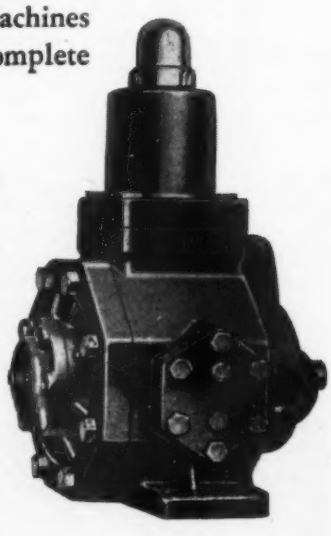

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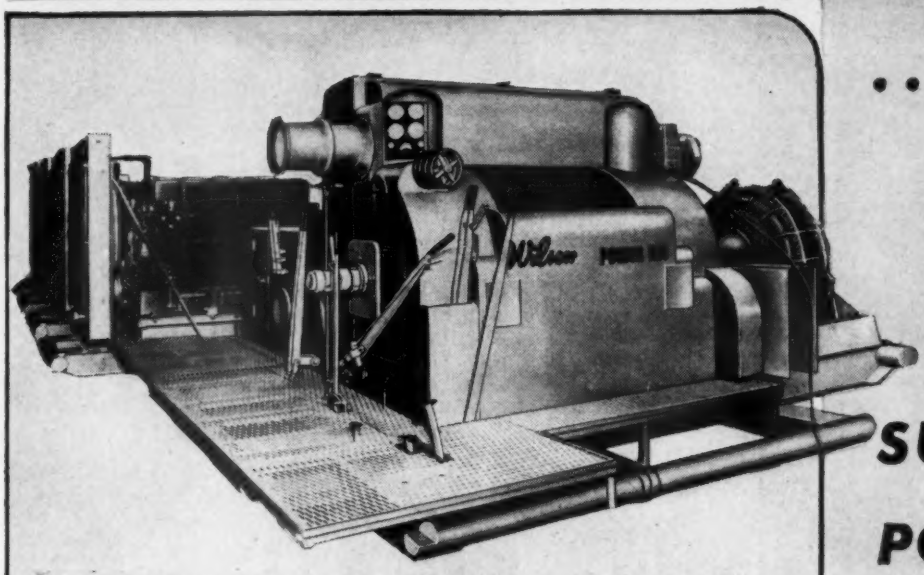

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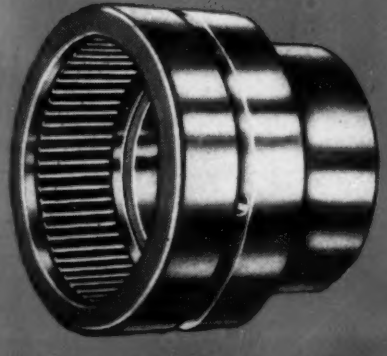
ORANGE ROLLER BUSHINGS



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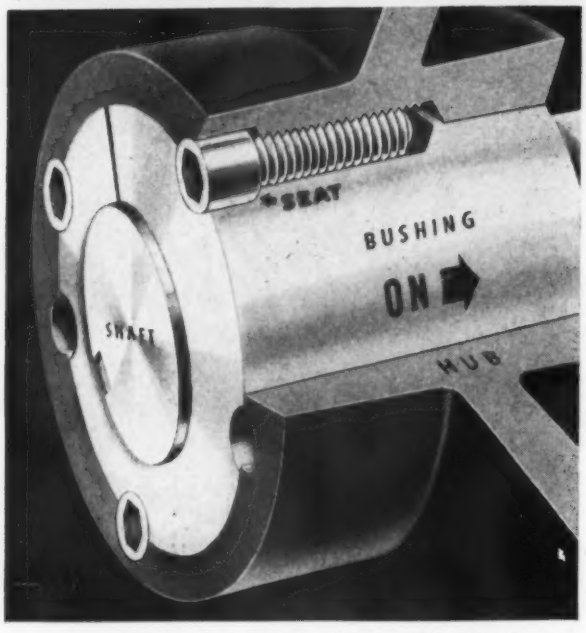
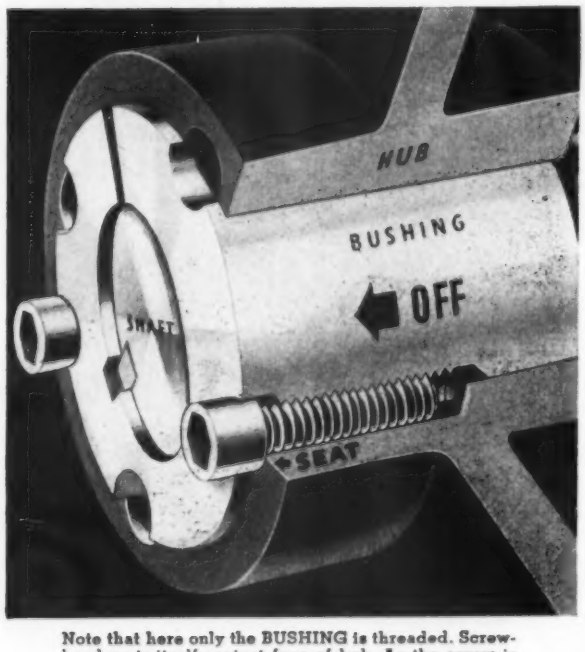
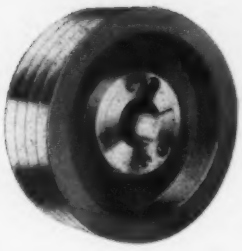
BRAND SHEAVE



Note that only the HUB is threaded. Screw-head seats itself against offset in bushing. As the screw is turned, the sheave is drawn up — wedged — with a firmness equivalent to a shrunk-on fit, whether the shaft is standard or normally undersize.



Note that here only the BUSHING is threaded. Screw-head seats itself against face of hub. As the screw is turned, the wedge is disengaged. Due to its steep taper, the bushing disengages with less effort than in any other sheave. It's easy on — and easy off!



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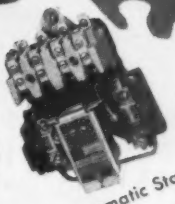
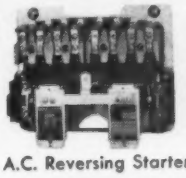
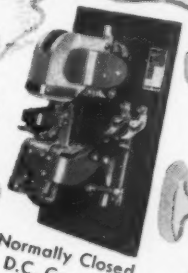
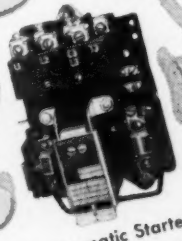

A.C. Automatic Starter

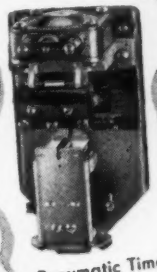
D.C. Contactor

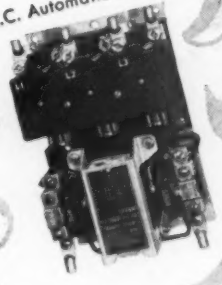

A.C. Reversing Starter

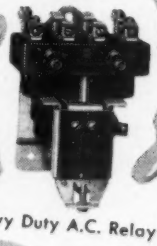
Heavy Duty D.C. Relay

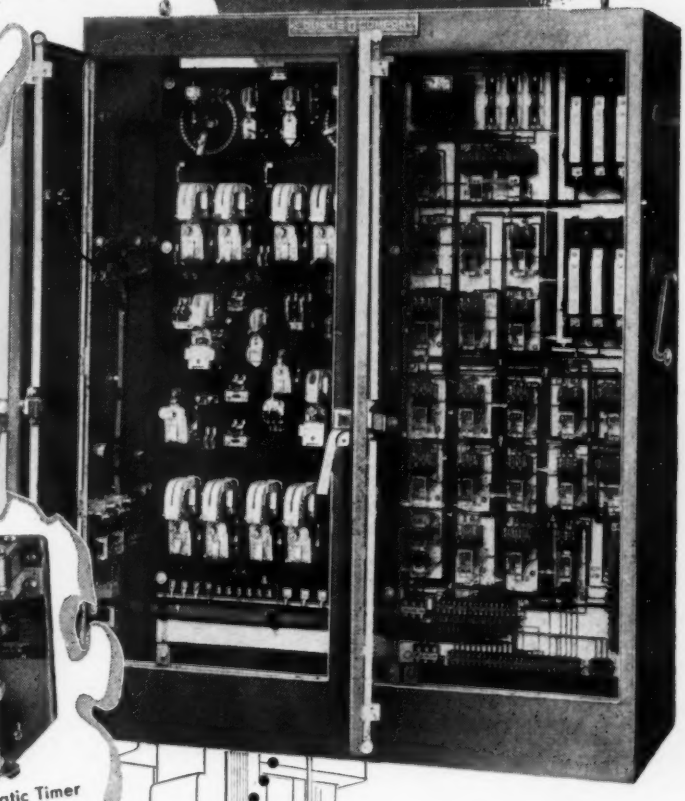

Normally Closed D.C. Contactor


A.C. Automatic Starter

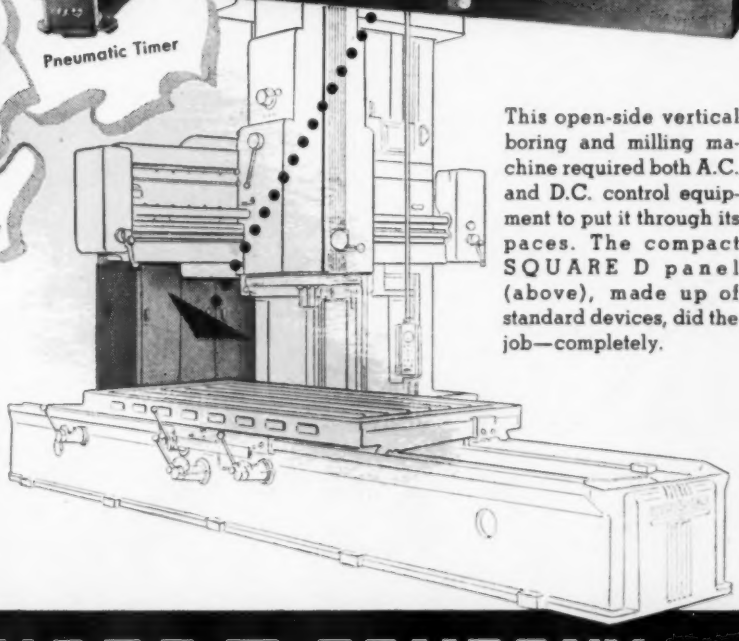

Pneumatic Timer


A.C. Automatic Starter


Heavy Duty A.C. Relay



This open-side vertical boring and milling machine required both A.C. and D.C. control equipment to put it through its paces. The compact SQUARE D panel (above), made up of standard devices, did the job—completely.



• SQUARE D's line of D.C. control matches its A.C. line in both completeness and performance. Thus, either standard or special control requirements—A.C. or D.C. or a combination of both—are easily met.

SQUARE D COMPANY

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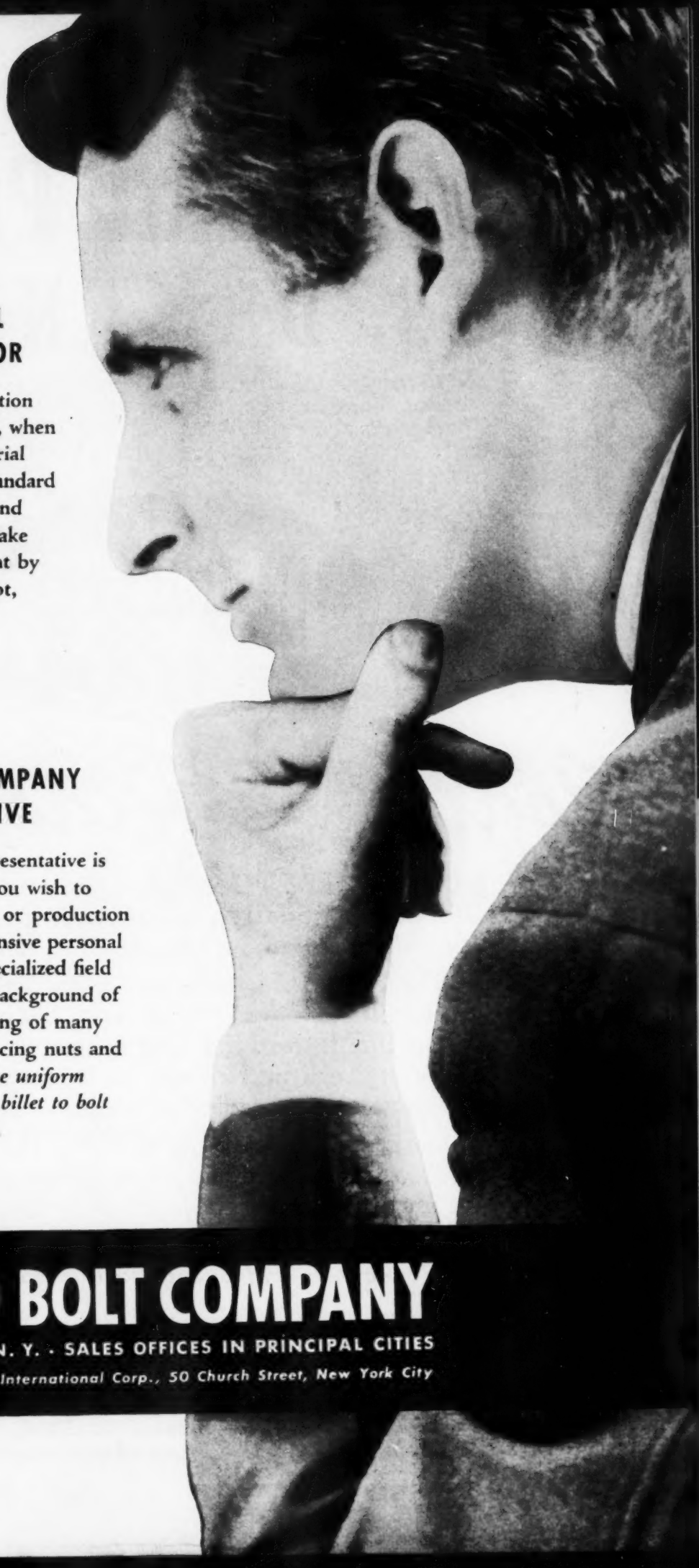
NUTS AND BOLTS...



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The remarkable size stability of DINOREFLEX FILM is due to its stable, transparent, vinyl copolymer plastic base—much lighter and thinner than glass—easily handled and stored.

• *You are invited to write or call upon us for complete and authoritative information.*

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Bearings that were using up too much oil and grease, taking too much maintenance, costing too much in shut-downs advertised this need.

Industry got the answer it wanted . . . from Fafnir . . . a complete line of ball bearing power transmission units. Fafnir engineered sealing and shielding systems, integrated with sturdy housings, kept lubricant in the bearing, kept out every particle of grit, "gunk", water, acid or other foreign substance. And, for good measure, Fafnir made these sealed, shielded and completely housed bearings the easiest bearings in the world to install.

These Fafnir Ball Bearing Power Transmission Units have jumped production up to 50%, saved a quarter of power consumption, cut oil consumption by the gallon every month and worked a 24-hour shift continuously for five years at a time without a single complaint.

That's the way Fafnir answers industry "wants" . . . not with just "what's on hand" but with what's in the experienced minds of Fafnir engineers . . . in the plant and out in the field. The Fafnir Bearing Company, New Britain, Connecticut.

MOST COMPLETE LINE IN AMERICA

FAFNIR BALL BEARINGS

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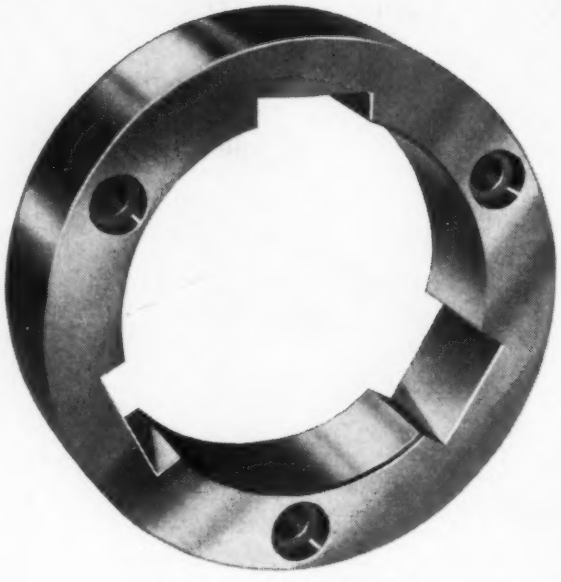
NEW *Convenience . . . Economy* *with* MAXITORQ RING TYPE DRIVING CUPS

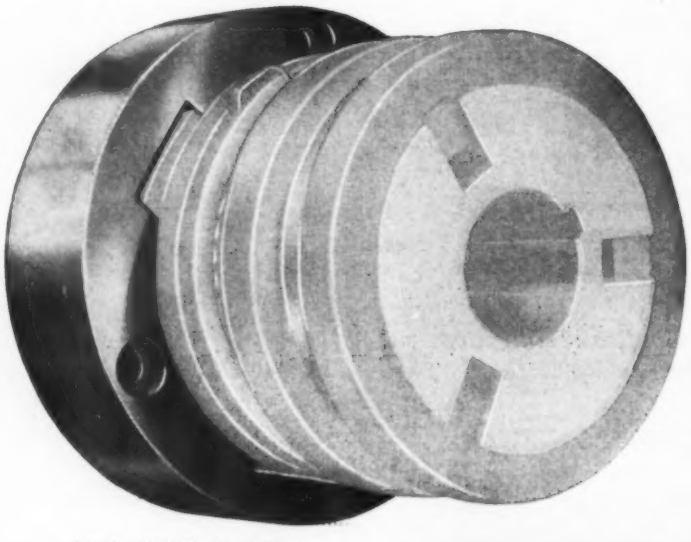
Maxitorq Ring Type Driving Cups have been designed to provide an economical means of adapting Maxitorq Floating Disc Clutches to various types of driven or driving members. They are made to standard specified limits in order to permit piloting the inside or outside diameter with pulley, fly wheel, sprocket, gear, sheave, etc. Bolt holes are counter bored to receive socket head cap screws for ease of tight, secure fastening.



NO NEED TO CHANGE BEARING DESIGN

In addition to the economy feature of Maxitorq Ring Type Cups, is the definite advantage of installation without change of present bearing design.

Moreover, users of Maxitorq Clutches have a decided price advantage in adapting Ring Type Driving Cups to their specific installations.



RING CUP USED WITH MAXITORQ CLUTCH

It is far better for machinery manufacturers to use Maxitorq Ring Type Driving Cups than to make their own. We are equipped with the precise tools and broaching fixtures to insure close tolerances, and accurate alignment of lug slots. Our experience in correct hardening prevents warping of the cup, which sometimes might occur.

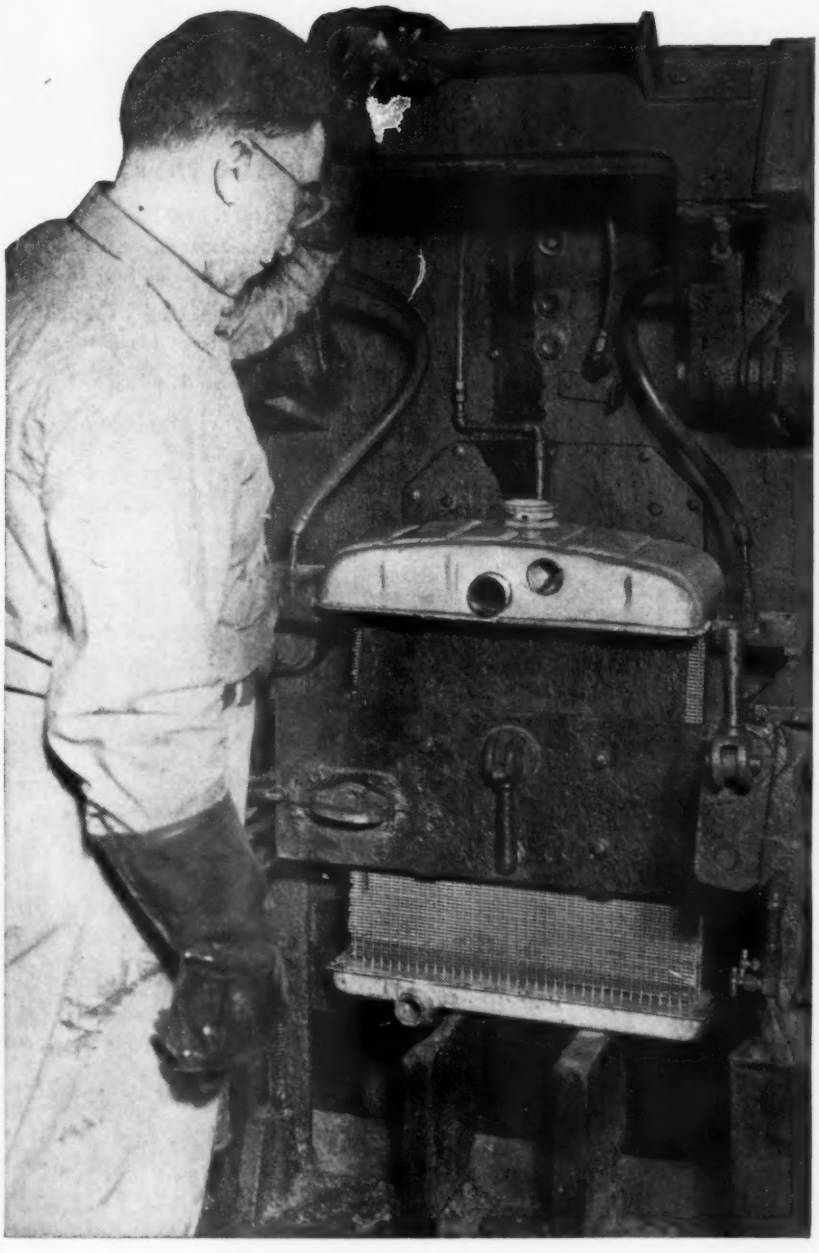
Construction is such that there are no apertures . . . the solid enclosure helps to prevent the entry of dust, dirt or any harmful material into the mechanism . . . and presents a neat, compact appearance.

SEND FOR SPECIFICATION BULLETIN NO. A-101

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER CONNECTICUT

TRADE MAXITORQ MARK

IH cuts soldering cost 58% with TOCCO Induction Heating



INTERNATIONAL HARVESTER COMPANY, world-famous builder of farm implements and automotive equipment, reports the following benefits from TOCCO Induction Soldering of radiator tanks to core:

CUTS COST 9¢ EACH

Former hand method cost 16.3¢ each for medium size radiator. TOCCO soldering costs 6.85¢ each, saving 58% on this operation.

IMPROVES QUALITY

TOCCO's automatically controlled heat melts uniform solder ring at 400° F . . . makes every joint perfect. Eliminates rejects. Improves service in field.

IMPROVES WORKING CONDITIONS

Operator simply loads and unloads fixture. TOCCO eliminates fatigue, heat and fumes.

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CM Bulletin 142 illustrates and describes every operating feature that makes the CM Meteor Heavy Duty Electric Hoist an outstanding production time-saver... cutting deep into materials handling costs. Helical gears, aeroplane cooling, low headroom, safety limit brake, simplified maintenance... these and other advantages are explained in terms of operating efficiency and service life. Various types trolleys and accessory equipment, lift and speed tables, dimensions, etc., are included.

We invite you to write today.
Just ask for Bulletin 142.

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That's only one of the many reasons why "Flexloc" SELF-LOCKING nuts will prove a wise buy. Just look at these advantages:

- It's all in one chunky piece and can, therefore, stand up under severe punishment
- Every thread—including locking threads—takes its share of the load
- Its construction is especially advantageous for maximum strength and dependability of thin nuts
- It accommodates itself to a very wide range of thread tolerances—from low #1 to high #3
- It can be used over and over again without losing its ability to lock
- It is not affected by temperatures likely to be met within the field of Mechanical Engineering
- Being a "stop" nut, it stays locked in any position on a threaded member
- It can be made of any of the conventional nut materials

Sizes from No. 0 to 1" in diameter: millions upon millions in use.

Write for Bulletin 582. The famous "Unbrako" Socket Screw and "Hallowell" Shop Equipment Products are also made by us.
"UNBRAKO" and "HALLOWELL" products are sold entirely through distributors.

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JENKINTOWN, PENNSYLVANIA BOX 4

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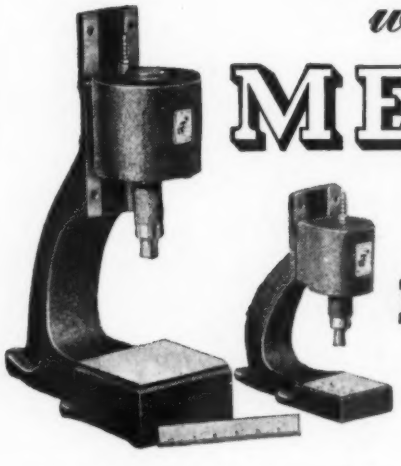

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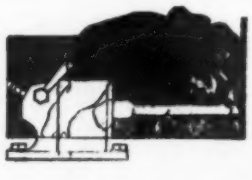

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4. **Interchangeability of Parts** is assured, because HAYNES precision castings are uniform in quality, size, contour, and finish.
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6. **Improved Metallurgical Properties** and sound, dense castings mean long life of stressed parts operating at high temperatures.
7. **Smoother, Cleaner Surfaces** than those generally obtained by conventional casting methods are possible.

For more complete information, write for the booklet, "HAYNES Precision Castings."

Here Are Some Samples of HAYNES Precision Castings in Use Today.

Haynes Stellite Company
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The registered trade-marks "Haynes," "Haynes Stellite," and "Hastelloy" distinguish products of Haynes Stellite Company.

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Let's clean house now— start scrap moving—

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Here's what you can do to help get much-needed scrap to Steel Mills.

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2 ***Consult Your Local Scrap Dealer*** to learn what size scrap brings highest returns—then flame-cut to size all obsolete machines, structural shapes, pipe, old boilers, and other large pieces.

3 ***Classify and Segregate*** alloy steels and other special materials to be sure they are used to best advantage and to obtain higher prices.

4 ***Move Scrap Fast*** when it is ready. Sell it, ship it—keep it moving.

Linde can help you work out a practicable scrapping program—just call our nearest office.

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To help you identify the common metals for proper scrap classification, we will be glad to send you, without charge, as many copies as you need of the wall charts "Identifying Metals by Spark Testing" (ask for form 4666) or "Simple Tests for Identifying Metals" (ask for form 2299).

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FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after January 1, 1947)

MACHINES AND ATTACHMENTS

1 FLUTE GRINDERS—Edward Blake Co., Newton Centre 59, Mass. 8-page bulletin illustrates and describes grinder for sharpening the angular flutes of spiral-point taps. Other straight- and angular-fluted tools can be ground.

2 MILLING MACHINES—Van Norman Co., Springfield 7, Mass. 6-page bulletin illustrates and describes Models 22L and 22M plain and universal, ram-type milling machines. These machines have an adjustable cutter head mounted on a movable ram.

3 CENTERLESS GRINDING—Waltham Grinding Wheel Co., Waltham 54, Mass. 4-page bulletin No. 16 describes and illustrates machine adjustments which will aid the operator in securing proper results from through-feed and in-feed centerless grinding.

4 SENSITIVE DRILL—Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn. 4-page bulletin describes M-100 sensitive drilling machine made by the Sigourney Tool Co., and sold by Pratt & Whitney. Face block may be inserted between column and base allowing increased distance from table top to chuck.

5 CUSTOM MACHINERY—Epworth Mfg. Co., Detroit 10, Mich. 12-page bulletin describes facilities for designing and building special machinery and illustrates various machines that have been made.

6 POWER-PRESS GUARD—W. H. Searjeant Co., Rochester 6, N. Y. 4-page bulletin describes counting-guard, a sweep-action guard for punch presses which includes a counter which registers each die stamping.

7 HYDRAULIC PRESS—The Denison Engineering Co., Columbus 15, Ohio. 28-page booklet covers Denison Hydraulic Multipress. Sections illustrate how various models can be used in a number of different ways.

8 INJECTION MOLDING—Watson-Stillman Co., Roselle, N. J. 12-page bulletin 620-D covers Series E horizontal machines with capacities from 12 to 28 ounces. Machines are said to be adaptable to intricate mold design and various plastic materials.

9 DIE CASTING—Hydropress, Inc., New York 22, N. Y. 8-page bulletin L-24-K covers full-hydraulic, cold-chamber machines for die casting copper, aluminum, magnesium and zinc. Capacities vary from 3 to 300 cu.in.

10 SAFETY GUARDS—Junkin Safety Appliance Co., Louisville 8, Ky. 4-page bulletin 102 describes swinging die closure. The guard is adjustable vertically and horizontally to all dies the press will accommodate.

11 THREADING MACHINES—The Geometric Tool Co., New Haven 15, Conn. 8-page bulletin No. TM-2 illustrates and describes No. 16 precision threading machine with lead screw. Threads up to 1 in. dia. in National Coarse and 1½ in. in fine pitch can be cut.

12 GEAR SHAVING—National Broach and Machine Co., Detroit 13, Mich. 20-page bulletin explains process of gear shaving and describes machines used for the operation.

13 VERTICAL MILLER—Linley Bros. Co., Bridgeport, Conn. 4-page bulletin describes high-speed vertical milling and jig-boring machine. The machine is designed to give precision accuracy on small work—jigs, dies, patterns, fixtures, and molds.

14 BROACHING—The Oilgear Co., Milwaukee 4, Wis. 24-page bulletin, No. 25000 describes type XP vertical pull-down broaching machines. Shown are 21 tool, fixture, and machine installations for internal and external broaching. Machines vary from 24- to 66-in. stroke.

15 DRILLING MACHINE—The Taylor & Fenn Co., Hartford, Conn. 2-page bulletin describes M-96 drilling machine. which includes variable-speed units to give any speeds within range of the machine. Standard spindle-speed range is 545 to 2180 rpm.

TOOLS AND ACCESSORIES

16 INTERNAL COMPARATORS—Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn. 20-page bulletin No. 475 describes line of Electro-limit internal comparators. Each is designed for accurately inspecting holes for diameter, roundness, taper, and "bell-mouth."

17 DIAMOND WHEELS — Diamonds and Tools, Inc., Detroit 3, Mich. 16-page bulletin lists sizes and types of diamond wheels with metal and ceramic bonds.

18 PUNCHES AND DIES—Richard Brothers Division of Allied Products Corp., Detroit 11, Mich. 48-page catalog covers complete line of standardized interchangeable punches and dies, together with parts and accessories. Related products are included.

19 HAND TAPPER—Bay State Tool and Machine Co., Springfield, Mass. 4-page bulletin illustrates and describes a hand tapper and a vise which can be used to hold work for tapping or for other purposes.

20 JET DRILLING—Republic Drill and Tool Co., Chicago 7, Ill. 8-page bulletin J-2 illustrates and describes Jet drill and director.

21 ADJUSTABLE GAGES—Barnaby Manufacturing and Tool Co., Bridgeport, Conn. 6-page folder describes inside adjustable gages which are available in sizes from ⅜ to 1½ in.

22 ROTARY FILE—Nicholson File Co., Providence 1, R. I. 4-page bulletin R-116 discusses selection and use of ground burs of high-speed steel and cemented carbide, and rotary files.

23 MICROMETERS — George Scherr Co., Inc., New York 12, N. Y. 8-page bulletin covers Scherr line of micrometers (formerly called Reed) in sizes from 0 to 6 in. in outside models, and inside and depth micrometers.

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24 VERTICAL SPINDLES—Pope Machinery Corp., Haverhill, Mass. Series of four, 4-page bulletins covers vertical motorized spindles of 1200, 1800 and 3600 rpm., and gives mounting data.

25 CARBIDE TOOLS—Schmarje Tool & Engineering Co., Muscatine, Ia. 8-page catalog No. 146 lists stock sizes of carbide-tipped tools including stub reamers, chucking reamers, jobber reamers, spotfacers, counterbores, and centers.

26 AIR TOOLS—The Rotor Tool Co., Cleveland, Ohio. 44-page bulletin No. 30 "How to Cut Costs with Rotor Air Tools" discusses type of tool to use for each of nine types of portable tool operations. Data are based on case studies.

HEAT-TREATING AND WELDING

27 RESISTANCE WELDING — Raytheon Mfg. Co., Waltham, Mass. 4-page bulletin on Condenser Weldpower illustrates and describes small resistance welding units with 56- and 200-mfd. capacity.

28 WELDING CHART — Eutectic Welding Alloys Corp., New York 13, N. Y. Chart lists company's products and suggested application, in bonding and remelting temperature for each alloy, Brinell hardness, and strength.

29 ELECTRONIC HEATING—Scientific Electric Div. of "S" Corrugated Quenched Gap Co., Garfield, N. J. 12-page booklet "The A B C of Electronic Heating" describes the process and illustrates equipment used.

30 ARC WELDERS — General Electric Co., Schenectady, N. Y. 20-page bulletin GEH-1334 covers dc. arc welders which are motor or belt driven. Includes instructions and parts list.

PLANT SERVICE EQUIPMENT

31 CRANES — Northern Engineering Works, Detroit 7, Mich. 4-page bulletin T-101 describes "Travelator" motor-travel unit which is applied to hand-power crane bridges.

32 BUS DUCT—Westinghouse Electric Corp., Pittsburgh 30, Pa. 40-page booklet B-3714 discusses selection and application of a bus-duct system for industrial plants. Three typical installations are analyzed in detail.

33 VIBRATION CONTROL — L. N. Barry Co., Inc., Cambridge 39, Mass. 8-page bulletin discusses analysis of vibration and describes machine mountings.

34 LIFT TRUCK—Mercury Manufacturing Co., Chicago 11, Ill. 48-page pocket catalog 201-6 covers tractors, trailers, and lift trucks, giving construction features, capacities, and designs of all models.

35 CONVEYORS — The Rapids-Standard Co., Inc., Grand Rapids 2, Mich. 4-page bulletin FV-4-5 covers "Floor-Veyor" power-belt conveyor for transportation between floors.

PARTS AND MATERIALS

36 CEMENTED CARBIDES — Kennemetal Inc., Latrobe, Pa. 56-page catalog 46 gives complete information on all standard products and some data on non-standard items. Discusses selection and application and includes instructions on use and maintenance.

37 SNAP SWITCHES—Micro Switch, Freeport, Ill. 108-page catalog No. 61 describes complete line of snap-action switches and illustrates applications for machine limits and control, positioning materials, and controlling current or temperature.

38 WIRES—Alloy Metal Wire Co., Prospect Park, Pa. 24-page catalog D-2 gives data on wire, strip, and rod for high temperature or corrosive applications, requiring high-nickel alloy.

39 SPEED REDUCERS — Philadelphia Gear Works, Inc., Philadelphia 34, Pa. 56-page catalog 200 on spiral-bevel speed reducers includes general description, detailed data, and illustration of typical installation.

40 GEARS—Quaker City Gear Works, Inc., Philadelphia, Pa. 20-page bulletin "Precision Gears for Industry" discusses gear-producing facilities and gives tables of gear tooth parts and gear formulas.

41 BEARINGS—Bearing Appliance Co., Philadelphia 44, Pa. 12-page bulletin No. 101 describes and gives data for standard covers for ball and roller bearings. Tables give data on standard sizes available.

42 VALVES—W. H. Nicholson & Co., Wilkes-Barre, Pa. 14-page bulletin No. 546 discusses control valves, flat-disk design, 2-, 3-, and 4-way type. Detailed description and data are given on each style.

43 FELT PARTS — The Felters Co., Boston, Mass. 40-page catalog describes uses of felt parts in industry and discusses selection of the proper felts, shapes, and dimensions.

44 OILLESS BEARINGS—Nolu Oilless Bearing Co., Germantown 44, Pa. 6-page bulletin describes self-lubricating machinery bearings which are hardwood sections impregnated with lubricating oil by a special process.

45 UNIVERSAL JOINTS—Curtis Universal Joint Co., Inc., Springfield, Mass. 6-page bulletin illustrates and describes line of universal joints and gives data on standard joints.

46 EXTRUDED BRONZES — Ampco Metal, Inc., Milwaukee 4, Wis. 16-page bulletin 64B describes and gives data on Ampco metal and Ampcoloy bronzes regularly extruded, including information on tolerances, weights, physical properties and mill lengths of rods. Roll sheet is included.

47 CUTTING FLUIDS—D. A. Stuart Oil Co., Chicago 23, Ill. 14-page bulletin No. 4 "Cutting Fluids, an Appraisal and an Apology" is a reprint of a paper presented by William H. Oldacre at an ASME Meeting.

48 PLASTICS—Plastics Dept., E. I. du Pont de Nemours & Co., Inc., Arlington, N. J. 12-page booklet gives brief descriptions of the various du Pont plastics and discusses workability.

49 VIBRATION—B. F. Goodrich Co., Akron, Ohio. 12-page bulletin describes Vibro-Insulators used to cushion vibrating equipment. An outline on proper selection for specific requirements is included.

50 TACHOMETER — The Bristol Co., Waterbury 91, Conn. 12-page bulletin S-1400 describes line of tachometer recorders and indicators. Includes application data and accessory information.

51 BEARING MANUAL—The Torrington Co., Bantam Bearing Div., South Bend 21, Ind. 168-page manual No. 15 contains general information and detailed data on ball radial, ball reciprocating, radial roller, taper roller, and thrust bearings.

52 STEEL CLEANERS—Pennsylvania Salt Mfg. Co., Special Chemical Div., Philadelphia 7, Pa. 4-page bulletin describes steel cleaners for electroplaters. Describes a typical cycle for processing low-carbon steel and discusses cleaners for each stage.

53 ELECTRICAL EQUIPMENT—Allis Chalmers Mfg. Co., Milwaukee 1, Wis. 16-page booklet No. B6452 describes eight types of electrical equipment, including motors, motor controls, transformers, and electronic heaters.

MISCELLANEOUS

54 FABRICATION — Fab-Weld Corp., Philadelphia 34, Pa. 8-page bulletin describes parts and assemblies produced, weldments, tubular fabrication, and other operations.

55 EMBOSSING AND DRAWING—S. B. Whisler & Sons, Inc., Buffalo 17, N. Y. 12-page bulletin describes hydrodynamic process for embossing and drawing sheet metal which is adapted to forming shallow sweeps and shapes and drawing cone-shaped and tapered stampings.

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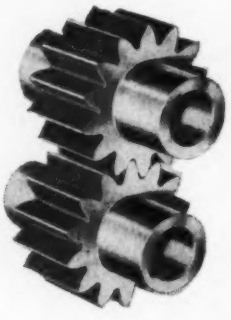

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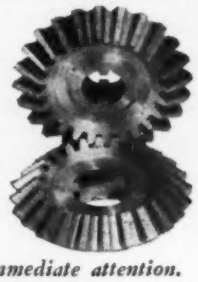

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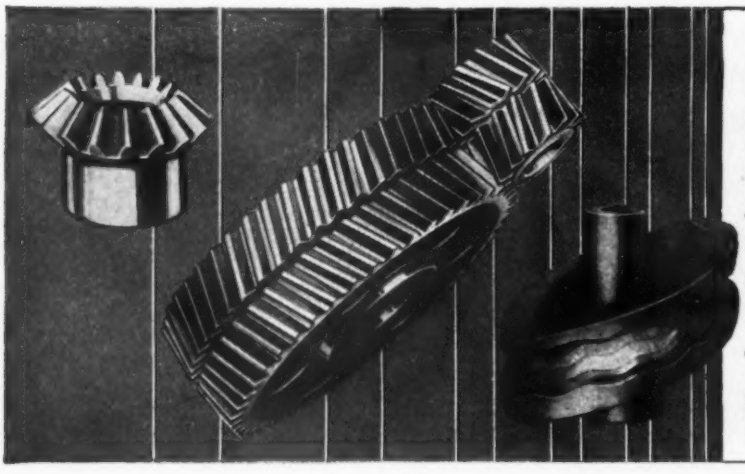

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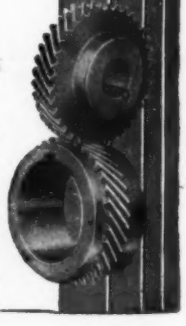

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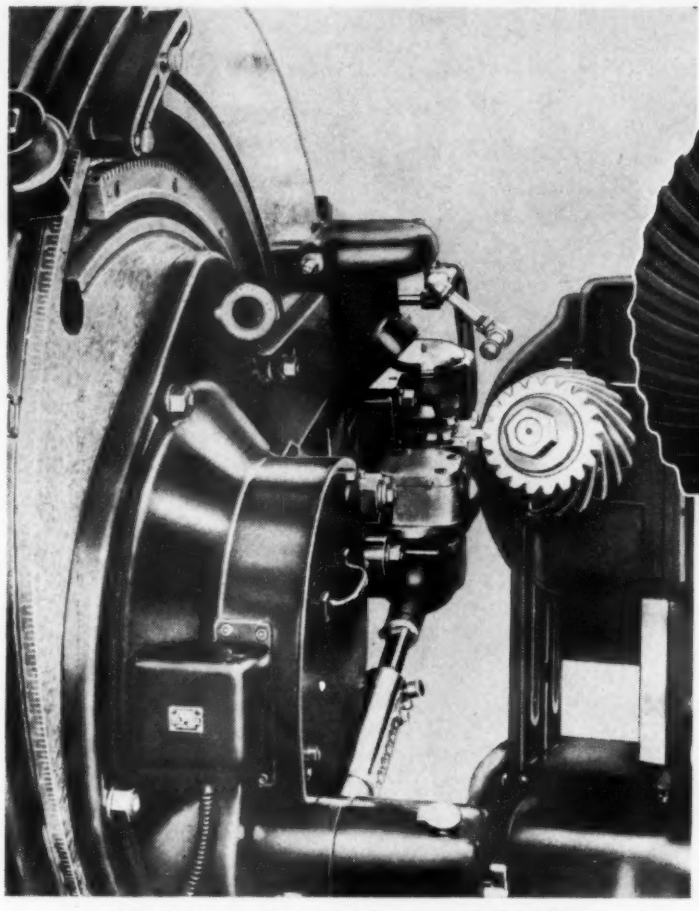

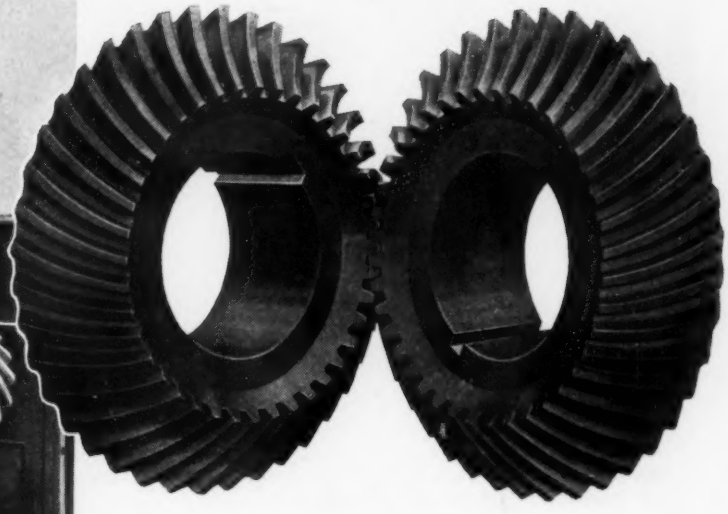

Above is shown a close-up of pinion on our 48" Spiral-Bevel Gleason Gear Generator; while at right (above) is a typical pair of curved tooth Spiral-Bevel Gears cut on one of our 18" capacity machines.

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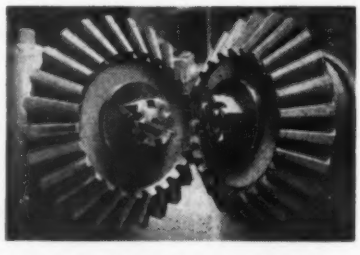

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Thrust, Ground
Thrust, Ground, Heavy Duty
Thrust, Light Duty
Thrust, Unground
Wheels, Pressed Steel

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BUSHINGS
Steel (For Hole Reduction)

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Ladder, High Tensile Steel, Small Pitch
Ladder, Steel, Small Pitch
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Roller, Double
Roller, Single, Non-Corrosive
Roller, Single
Stud, Small Pitch

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6 to 80 Diametral Pitch

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Steel and Iron

GEARS, HELICAL
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GEARS, INTERNAL
Brass, Small Pitch

GEARS, MITER
Brass, Small Pitch
Iron
Steel

GEARS, MITER, SPIRAL
Steel

GEARS, SPUR
Brass, Small Pitch
Brass, Sheet, Small Pitch
Change Gear Type
Fabroil
Non-Metallic
Pinions, Stem, Steel (5–10 Teeth)
Steel, Small Pitch
Steel and Iron
Steel and Iron (20° P.A.)

GEARS, WORM
Bronze, Single Thread
Bronze, Single Thread, Small Pitch
Bronze, Double Thread
Bronze, Double Thread, Small Pitch
Bronze, Four Thread
Bronze, Four Thread, Small Pitch
Iron, Single Thread
Iron, Double Thread
Iron, Four Thread

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Ball Bearing, Flanged Cartridge Type
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Ball Bearing, Welded Steel
Cast Iron, Split
Cast Iron, Split, Oilite Bearing

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Brass
Steel

PULLEYS
Brass, Grooved, Round Belt
Iron, Cone, Round & V-Belt
Iron, Grooved, Round Belt
Iron, Grooved, V-Belt
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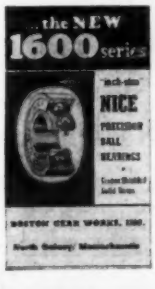
UNIVERSAL JOINTS
Steel, Bored
Steel, Unbored

WASHERS
Steel, Hardened, Thrust Type

WORMS
Steel, Single Thread
Steel, Single Thread, Small Pitch
Steel, Double Thread
Steel, Double Thread, Small Pitch
Steel, Four Thread
Steel, Four Thread, Small Pitch
Steel, Hardened and Ground
Steel, Unhardened



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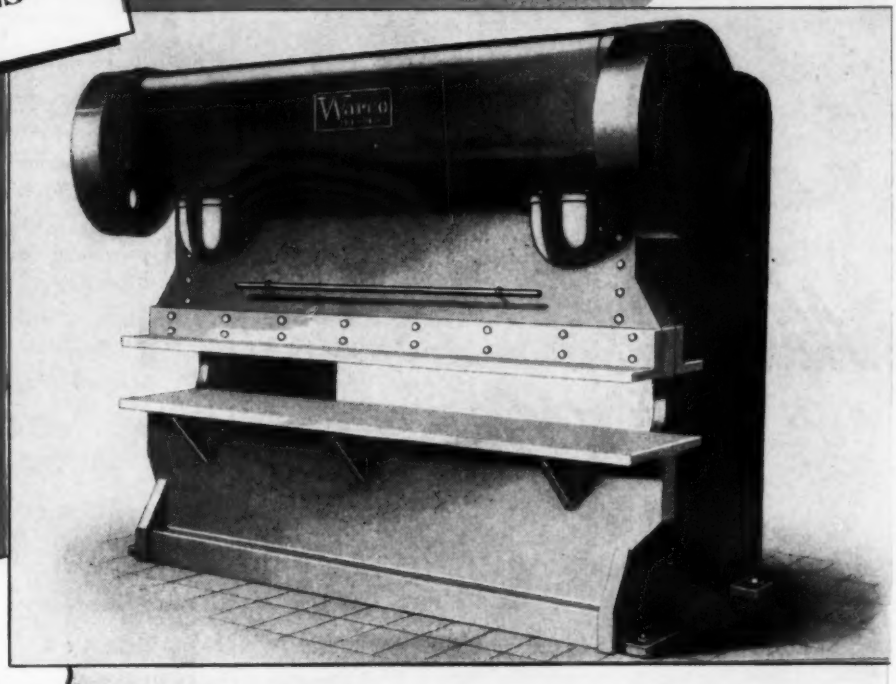

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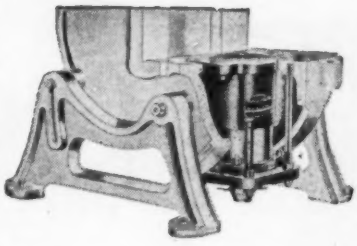

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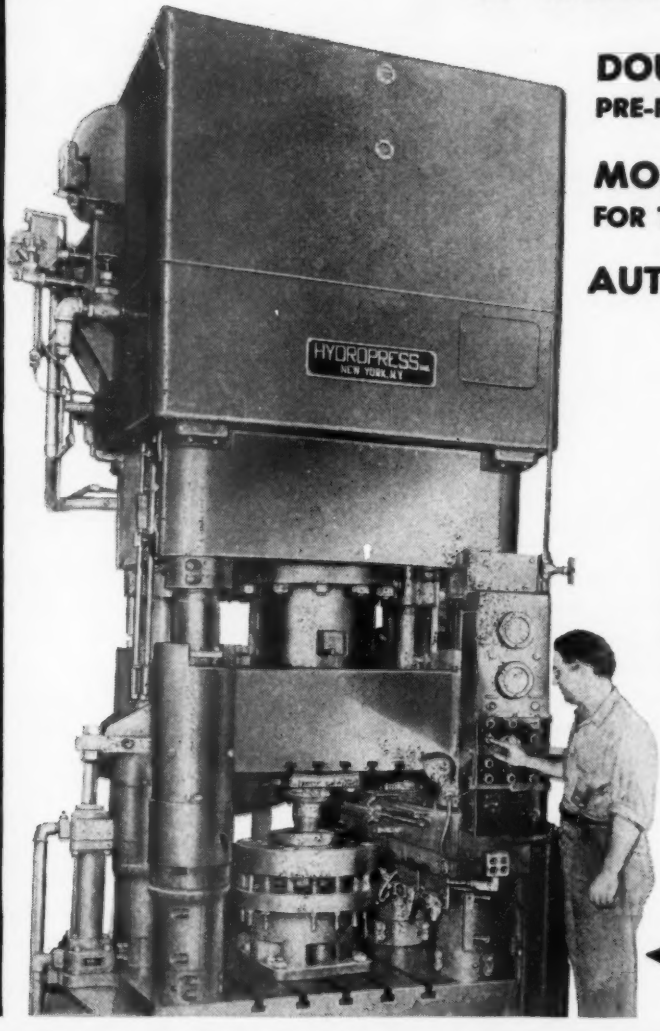

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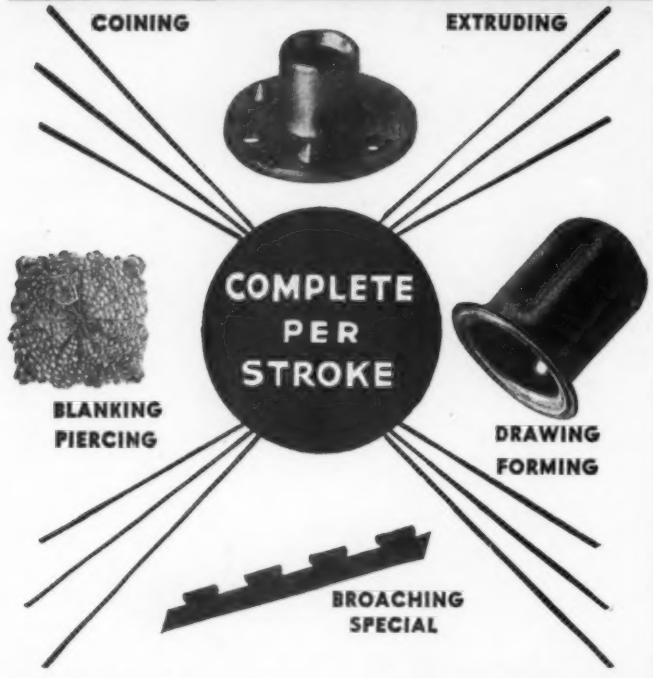

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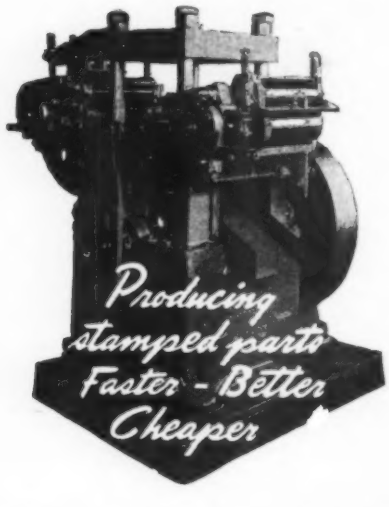

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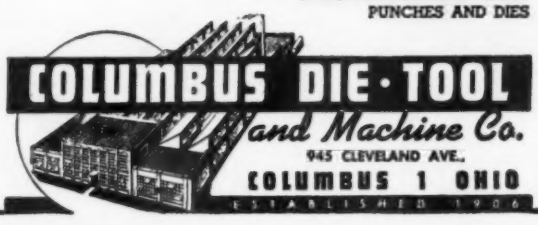
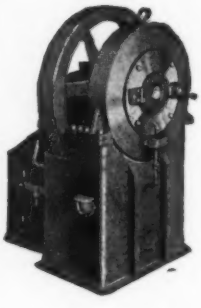
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



COLUMBUS DIE·TOOL and Machine Co.

945 CLEVELAND AVE.
COLUMBUS 1 OHIO
ESTABLISHED 1906



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street — Torrington, Conn.

Available for IMMEDIATE DELIVERY

HUB POWER PRESS

for speed, accuracy and economy

These convenient, high speed, power presses will handle materials with ease and convenience. Assures high production of parts at lowest cost.

Made in 4½, 6 and 15 Ton Capacities.

Send for Circulars and Prices.

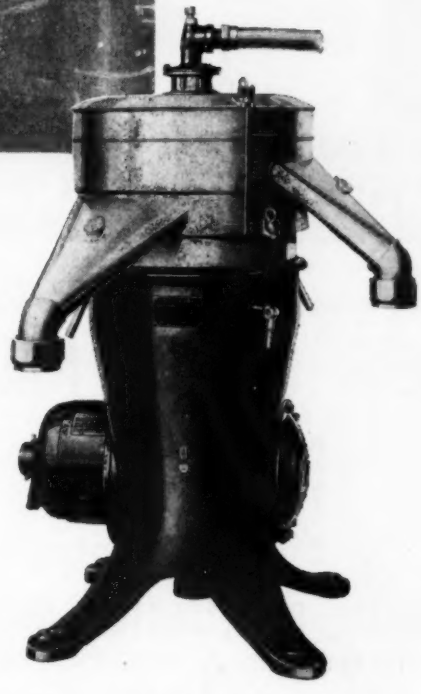
WILLIAM F. BREWER MACHINE CO.
75 LAUREL STREET — HARTFORD 6, CONN.

DON'T LET YOUR PRESS BE DAMAGED BY CONDENSATE

WATER can do a lot of damage to presses and other hydraulically - operated mechanisms. Condensate in hydraulic oils can rust pumps, valves and controls, can cause leather seals to harden. Dirt and sludge, too, can score highly finished surfaces and make costly repairs necessary.

De Laval Oil Purifiers save hydraulic mechanisms in presses and other machines by providing a ***continuous*** supply of oil, free from dirt and water—oil that can be used with perfect safety indefinitely in any hydraulic application.

Because they are wholly mechanical in action, operating by centrifugal force, De Laval machines discharge oil that is uniformly clean. There is no lessening of efficiency during the run of the Purifier.



The De Laval Oil Purifier above is the type generally used to purify hydraulic oil, cutting oil and other factory oils. Various other models are available for specific purposes.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

Save more than the Oil with

PURIFIERS and CLARIFIERS FOR FACTORY OILS

DE LAVAL

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

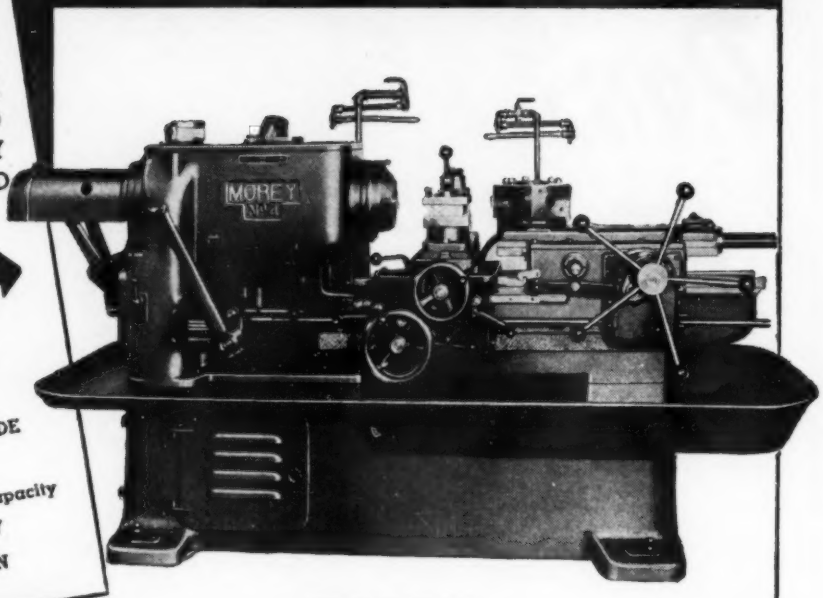
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity

ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

★
SAVES TIME
MAKES MONEY
★
CUTS ANY SHAPE
CUTS ANY SIZE
★
CAPACITY UP TO
¼" STOCK

MARSHALLTOWN
THROATLESS SHEARS

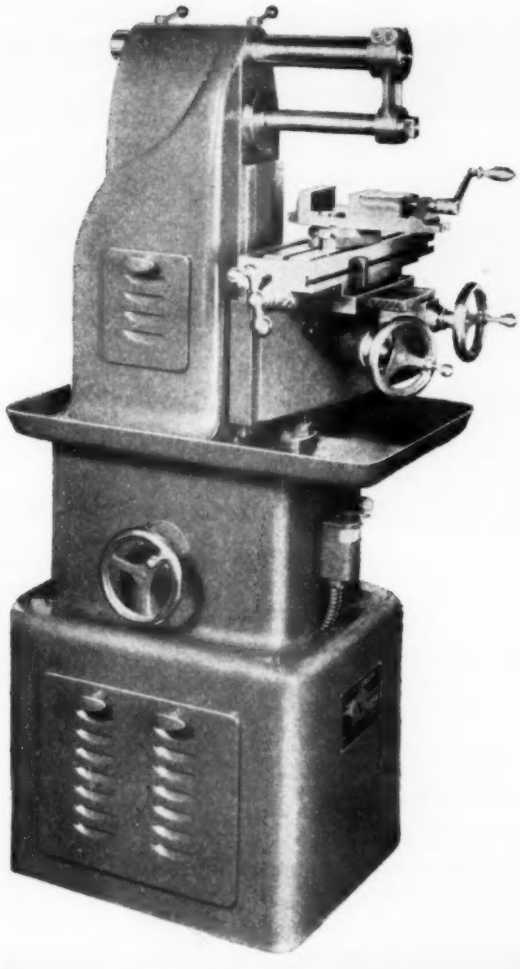
Here's the shear that offers best performance features. Cutting speed 6' per minute. High grade tool steel cutters. Write today for details. Prompt shipment.

MARSHALLTOWN MANUFACTURING COMPANY
910 Nevada Street Marshalltown, Iowa

SHELDON Vernon

Now Available!

*See the new SHELDON Machine tools at Space No. A*183, *National Metal Congress, Atlantic City, November* 18 *to* 22



Coming off the new production lines in Chicago, the SHELDON-built SHELDON-Vernon Precision Machine Tools* are now available at the same moderate prices that made them first in the moderate priced field. Built in the new modern SHELDON plant which is equipped with every advanced machine tool building facility, they are better than ever—even more accurate, more rugged and better finished.

Lighter and smaller and less costly than machine tools of equal accuracy, they provide a faster, more convenient and economical means of doing all but the heaviest operations.

Write for Bulletin on:

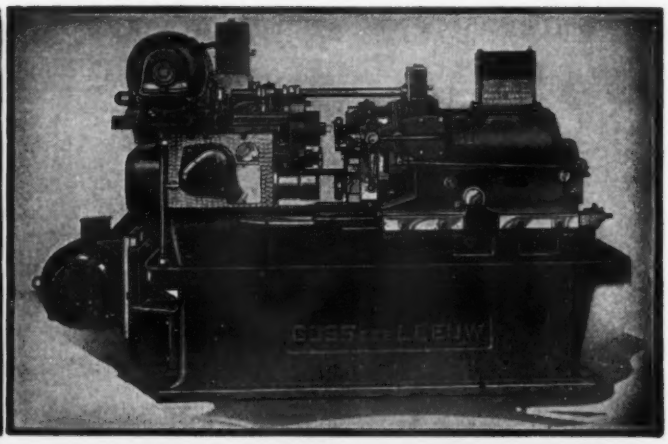
- **SHELDON-Vernon Horizontal Milling Machine**
- **SHELDON-Vernon Vertical Milling Machine and Jig Borer**
- **SHELDON-Vernon 12″ Shaper**

***Builders of Good Lathes Since 1919*

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Arbor Presses • Vises
Sheldon-Vernon Horizontal Milling Machines • Vertical Milling Machines and Jig Borers • Shapers

4234 N KNOX AVENUE • CHICAGO 41 ILLINOIS U S A



GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

IF YOU'RE LOOKING FOR **TRULY HIGH PRODUCTION**

investigate this

PORTER-McLEOD COLD METAL SAWING MACHINE

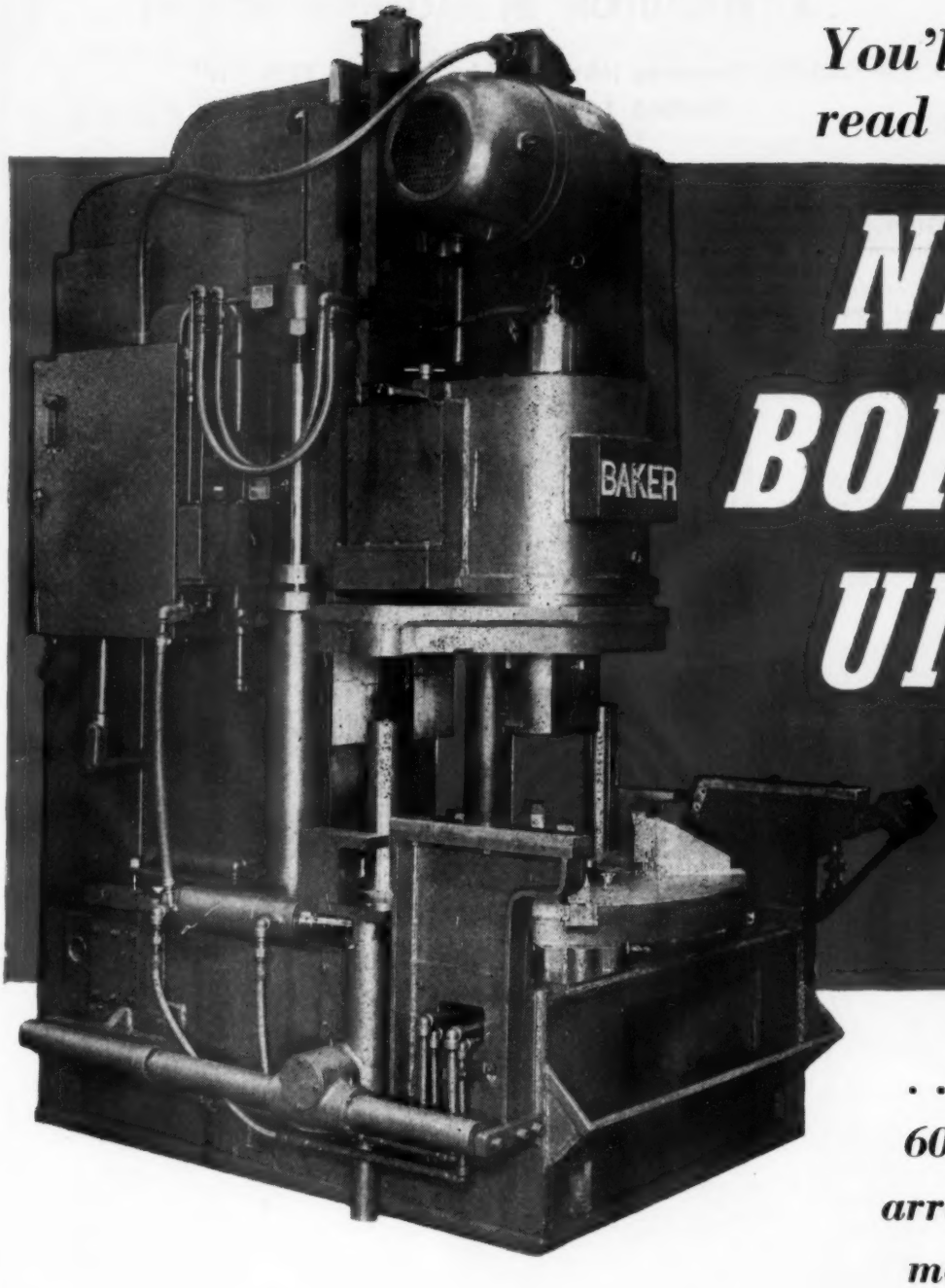
Your problem of relieving bottlenecks in cutting-off operations and keeping production moving at top speed can be solved by this 8" powerful, convenient Porter-McLeod machine.

With a capacity for cutting 8" round or 7½" square stock and arranged so that stock can be nested for multiple cuts together with a standard feed of 3" per minute, a wide variety of work can be cut on a high production basis.

Speed with safety and accuracy is assured by pulling the blade upward through cut, with blade supported close to its rim to eliminate the possibility of buckling and weaving. A friction disc feed insures against blade damage and breakage. Blade design is such that every tooth cuts.

Get all facts today concerning this fast, accurate, straight-cutting machine. Write for Illustrated, Descriptive Bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.



You'll want to read about this

NEW BORING UNIT

. . . a new Baker 60-HO Vertical— arranged for a new method of boring

RIGIDITY is an improtant feature of this new heavy duty BAKER unit. It is now in use on rough boring operations in the center section ("banjo" housing) of a popular truck axle. Extra large spindles are driven by an enveloping worm and worm gears mounted at the lower end of the spindle. The spindles, measuring 6¼" in diameter, are set in preloaded ball bearings. Heads on the saddles are designed for flexibility in speed changing. Speed changes for the heads are made with pick-off gears. For adjustment of the range of spindle speeds the ratio of the vee-belt driving sheaves is changed. The machine is furnished with special quick-acting fixtures, locating the housing from jaws around the center of the housings. The jaws are hydraulically operated. The unit is also equipped with a fixture to raise and lower the axle housings and a special cutter head, mounted direct to the spindle end without any extra tool supports.

Write, describing your special requirements. There is a BAKER machine to fit them!

BAKER Bros., Inc.

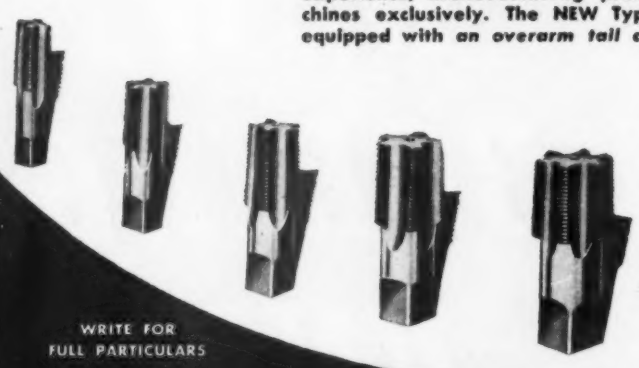
Single and Multiple Spindle Machines for Drilling, Boring and Tapping TOLEDO 10, OHIO

. . . A "REVOLUTION" IN MACHINING INDUSTRY . . .

TOUGH Threading jobs licked by COULTER TYPE "H" THREAD TAP MILLING MACHINE

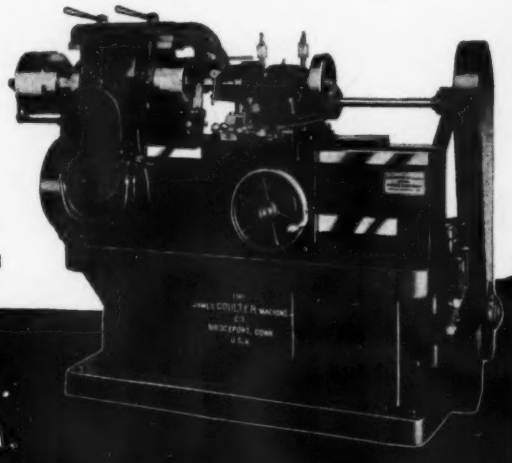
NOW . . . comes a development that extends the capacity of this 'wonder' machine. COULTERS' are made to perform the most delicate threading operation with both speed and accuracy . . . 40 years of specialized experience, manufacturing precision machines exclusively. The NEW Type "H" is equipped with *an overarm tail center and large collet chuck*, holding the work rigidly so *ONLY ONE REVOLUTION OF THE TAP* is necessary.

Any number of FLUTES, eccentric or con-eccentric relief straight or taper can be produced. Pipe taps from ⅛" to 1½" and straight taps from ¼" to 1½"



WRITE FOR FULL PARTICULARS

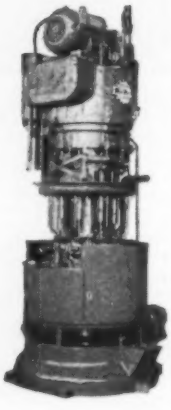
PRODUCTION MACHINES SINCE 1896



TYPE H

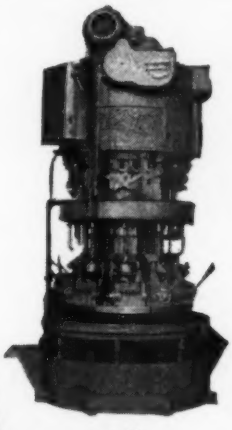
The James **COULTER** *Machine Co.*

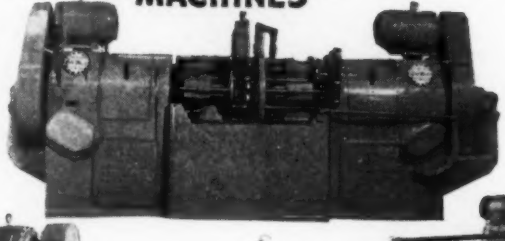
BRIDGEPORT • CONNECTICUT • U.S.A.

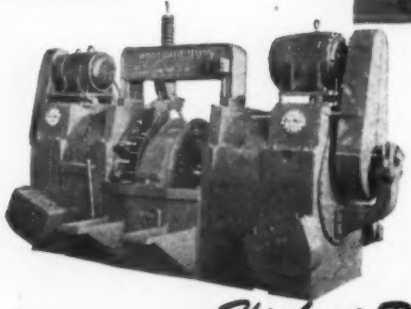


Roto-Matic Drilling MACHINES

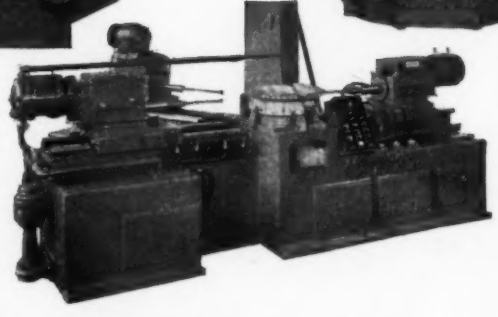
VERTICAL AND HORIZONTAL TYPES







MULTIPLE SPINDLES



Highest Production — Low Maintenance

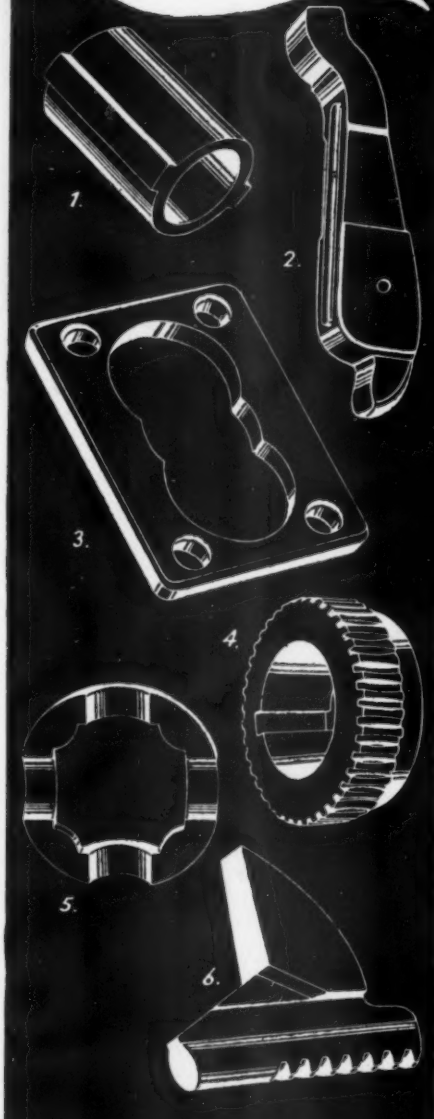
MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

TYPICAL
BROACHING
JOBS THAT
Cut Costs
PARTS
YOU PRODUCE
MAY BE
SIMILAR !



1. Double integral key bushing for change gears.
2. Pawl
3. Gear pump center plate
4. Aircraft gear
5. Half Universal joint
6. Adjustable wrench jaw

CASE HISTORY
WASHING MACHINE GEAR SEGMENT

Segment broached from solid. Cutting 13 involute teeth of 10 pitch, 20° pressure angle, tooth depth .216" must be properly located from center hole and angularly positioned from ½" hole at periphery.

Production Rate Increased **500%**
BY BROACHING

BEFORE
COMPLETED
BEING BROACHED
Simple fixture holds part to extreme accuracy. Unnecessary to remove broach while loading.

BROACHING means
SPEED, ECONOMY, PRECISION

If a part can be machined by the conventional methods of milling, drilling, shaping, etc., it can usually be broached — cheaper, faster, and with equal precision.

If you're planning ways to cut production time and costs, it will pay you to let LAPOINTE engineers show you what LAPOINTE broaches and broaching machines can do for you.

THE *Lapointe*

MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS · U.S.A.

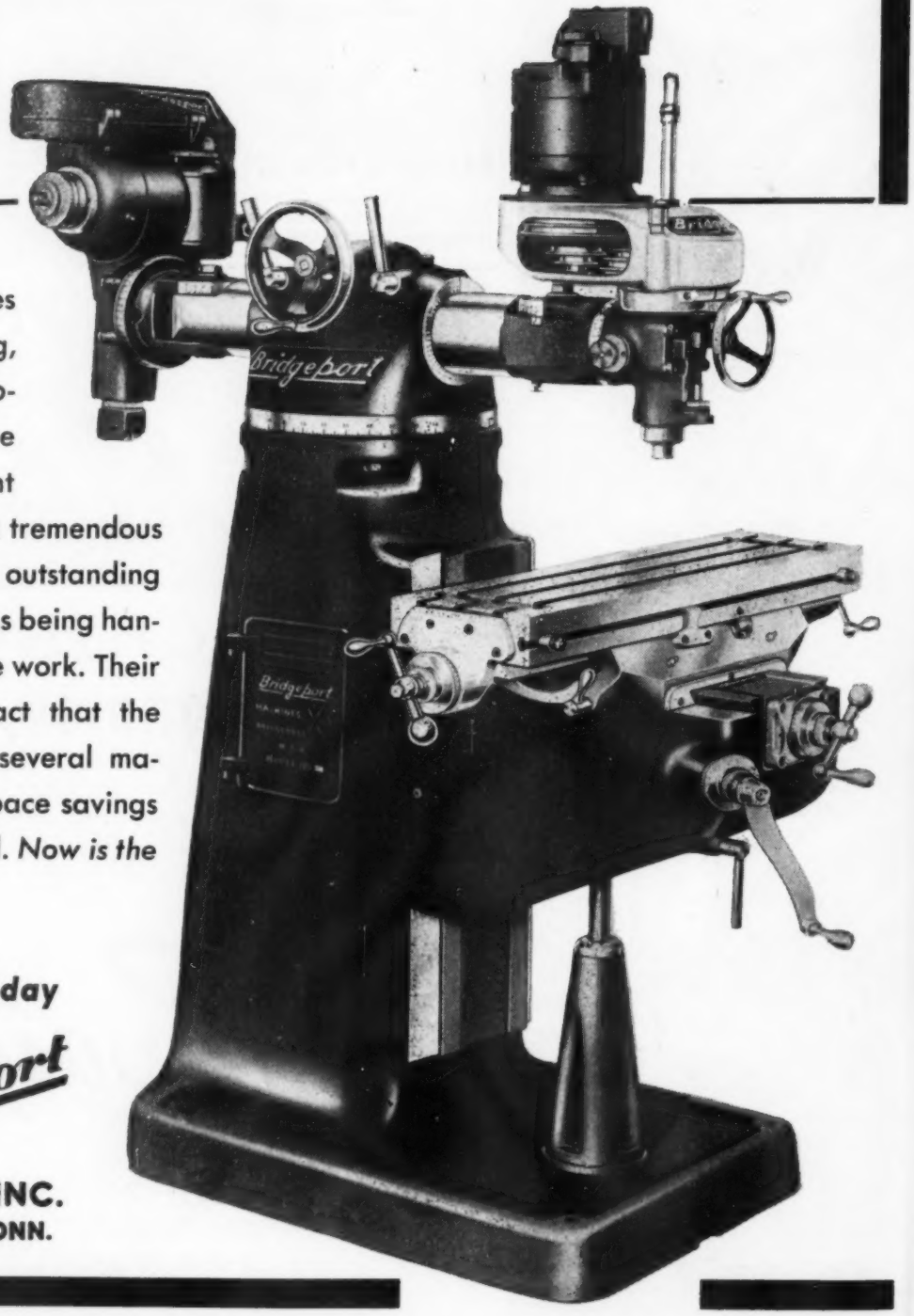
OLDEST AND LARGEST MAKERS OF
BROACHES AND BROACHING MACHINES

Bridgeport

TURRET MILLING MACHINE

SPECIFICATIONS

Longitudinal Feed—20"
Cross Feed—9"
Vertical Feed of Knee—16"
Standard Table—9" x 32"
Special Tables up to 48" available; also longitudinal power feed
Weight with Shaping Unit—2000 lbs.



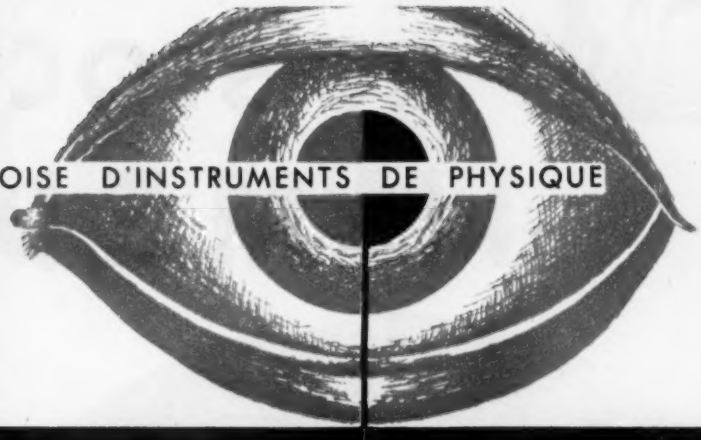
These versatile machines . . . designed for milling, boring, drilling and shaping at all angles . . . are modern, fast, convenient and accurate. They are in tremendous demand because of their outstanding time savings, all operations being handled with one set-up of the work. Their compactness, plus the fact that the "Bridgeport" is actually several machines in one, results in space savings in any shop, large or small. *Now is the time to investigate.*

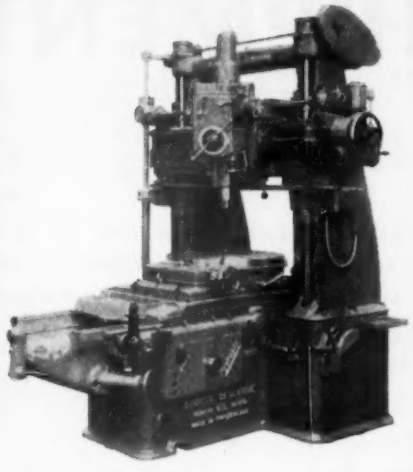
Investigate Today

THE Bridgeport MACHINES, INC.
BRIDGEPORT, CONN.

HYDROPTIC-B

SIP SOCIÉTÉ GENEVOISE D'INSTRUMENTS DE PHYSIQUE





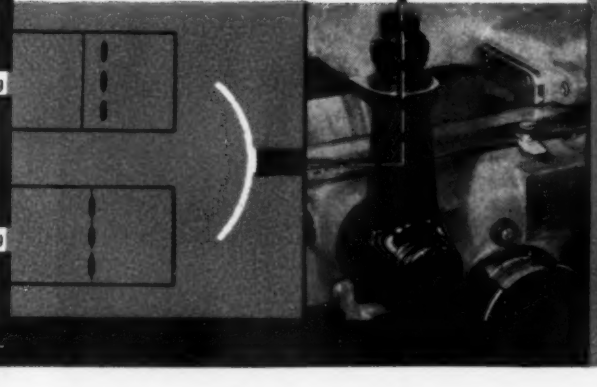
JIG BORING AND MILLING MACHINE

On the SIP HYDROPTIC-B work can be *located, drilled, bored* or *milled* without preliminary laying out and AN ACCURACY FOR ALL SETTINGS OF WORK TABLE AND SPINDLE HEAD OF 0.0002" IS GUARANTEED. The HYDROPTIC-B is more than a jig boring and milling machine since it is also a measuring instrument of unquestioned accuracy.

The measuring system built into this machine represents the ideal setting method since it is actually free from wear and mechanical stress and therefore of absolute permanent accuracy.

SIP Jig Borers are available in the following models:

	RANGE OF TABLE SIZES
No. 2C	18 " x 10¾"
No. 3E	21½" x 15 "
No. 4G	27½" x 23⅝"
HYDROPTIC-B (Illus.)	39½" x 32 "
No. 5G	43¾" x 32 "



COSA CORPORATION

HIGH PRECISION HEADQUARTERS

COSA

405 LEXINGTON AVE.
CHRYSLER BUILDING
NEW YORK 17, N. Y.
MUrray Hill 7-7107

MILLING MACHINES IN STOCK — FOR IMMEDIATE SHIPMENT

●

CURRENT production conditions put us in a position to offer a number of Cleveland No. 1 Vertical Milling Machines for immediate shipment. These are fresh-from-the-production-line . . . factory inspected standard machines . . .

●

The specialty of Sommer and Adams for more than a quarter of a century has been the designing and building of special purpose machinery—mostly aimed at doing something no other machine will do, all aimed at cutting time and cost in production. S and A creations range all the way from two-story, fully automatic multi-operation machines to small items like the Cleveland Vertical Milling Machine, at left.

This is a small, rigid, high-speed unit embodying all of the features essential to modern milling practices. Popular demand has converted it from a special machine to a standard item which thousands of tool and die makers, and production plants find a practical necessity.

Ten chances to one there's a spot for one of these productive machine tools in your shop. *

It is probable, too, that S and A have the answer, in their years of special design experience, to some particular production problems hampering your cost control.

** Subject to prior sale, current available stock will be shipped immediately upon receipt of order.*

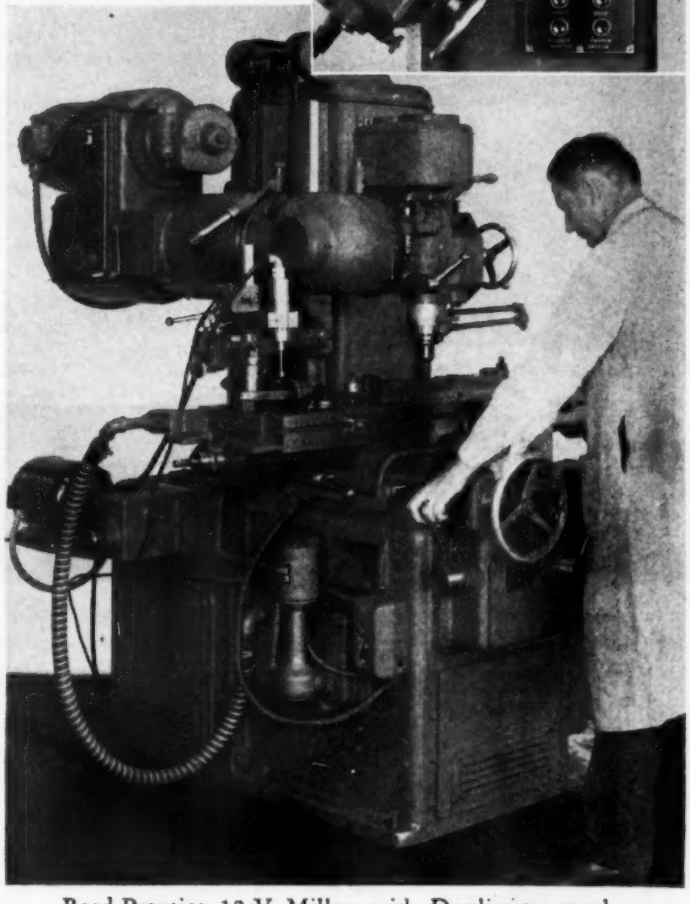
THE SOMMER & ADAMS COMPANY

18501 EUCLID AVENUE, CLEVELAND 12, OHIO

Custom-Built EQUIPMENT FOR MANY PURPOSES

SUBSIDIARY OF THE FEDERAL MACHINE AND WELDER COMPANY

Introducing
EASY OPERATION
IN THE TOOLROOM!



Reed-Prentice 12-V Miller, with Duplicator attachment. Upper view — control panel conveniently mounted on column.

The 12V UNIVERSAL HEAD VERTICAL MILLER

is a high speed miller, die sinking and boring machine — all in one, for use in making molds and fixtures from start to finish — with a minimum of re-setting work.

This machine will cut your operations time cost because (1) cross longitudinal and vertical feeds are infinitely variable and are governed by centralized electronic controls, (2) spindle speeds are also infinitely variable and are governed by push buttons located on the same control panel, (3) finger-tip lever controls for directional rapid traverse and feed are readily accessible, (4) universal head swivels 45° front and back of vertical, 30° left and right of vertical.

The combination of the universal angle head, infinitely variable change of feeds and speeds governed from a central control panel, result in much wider range of work and cuts cost by minimizing set-up time. The general design eliminates operator fatigue and results in fast, accurate and economical work. For full information write Dept. A.

SPECIFICATIONS

CAPACITY

Max. distance Table to face of spindle ... 18"

Max. distance Spindle to column ..... 26"

Min. distance Spindle to column ..... 12"

TABLE

Feeds: Infinite per Min.

Longitudinal ..... 1/4" to 24"

Cross ..... 1/4" to 24"

Vertical ..... 1/8" to 16"

Size: working surface 12" x 46"

3 T-Slots (spaced 3") size ..... 11/16"

SPINDLE

Infinite Speeds ..... 97 to 1730 RPM; arranged for # 40 NMTBA Taper.

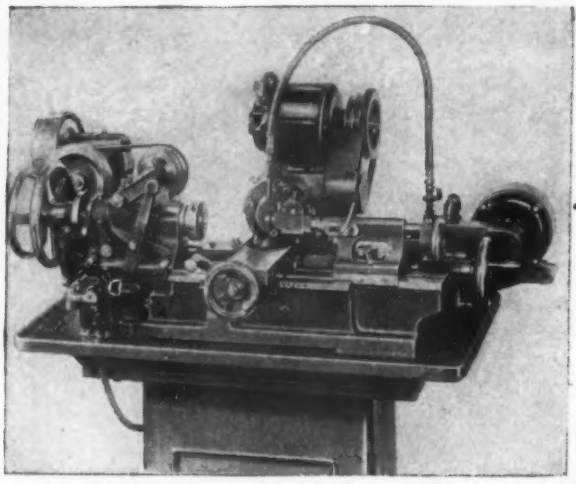
MACHINE TOOLS

REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

NEW YORK OFFICE: 75 West St., New York 6, N. Y.

CLEVELAND OFFICE: 1213 W. 3rd St., Cleveland 13, Ohio.



WALTHAM THREAD MILLERS

provide versatility and precision in small thread production

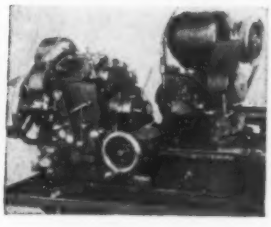
Designed especially for small work calling for close tolerances, WALTHAM THREAD MILLERS can be depended on to meet the most exacting specifications for precision parts.

An outstanding feature of these improved machines is the use of three motors, one each for driving cutter, work and pump. Machines can be arranged with speeds suitable for brass or steel or both. Motors are wired so that a single start and stop station will control all at one time.

Standard equipment includes three motors with control, follow rest, milling cutter, indexing device, 5 pitch lead screw and change gears for cutting from 5 to 40 threads per inch.

A wide range of special equipment is available and greatly enlarges the usefulness of this machine. Full details on request. Write for Bulletin 244A.

(Left)—Waltham Thread Miller equipped with Internal Threading Attachment.



(Below)—Waltham Thread Miller equipped with Relieving Head.

CONDENSED SPECIFICATIONS

Swing over carriage—3"
Dia. work handled—2" or smaller
Thread length (work held on centers)—8¾"
Thread length (work held in chuck)—10"
Max. Dist. between centers—12"
Floor Space—48"x34"
Net Weight—850 lbs.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

WALTHAM MACHINE WORKS,
WALTHAM, MASS.

CHECK LINLEY . . .

THE TOOLROOM "HANDY MAN"

There are countless profitable uses for the little Linley Miller and Jig Borer in busy tool rooms. This compact unit (needs only 2½ sq. ft. of space) does a wide variety of small jobs on dies, jigs, fixtures, patterns and models . . . quickly, accurately, economically. Saves your larger, higher rated machines for more expensive work.

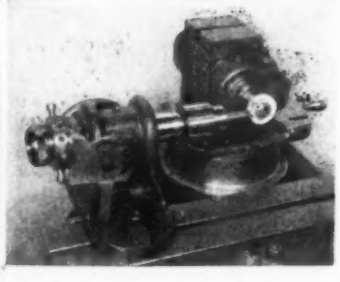
Setup is easy, changeover rapid . . . 8 velvet-smooth spindle speeds to 4250 r.p.m. . . . no backlash in quill travel . . . direct micrometer setting . . . parts balanced for operating efficiency. Has ample (7" x 17½") table size; 11½" from table top to spindle end.

Put this profitable "handy man" to work for you . . . now.

Get detailed bulletin.

LINLEY BROTHERS COMPANY
864 STATE ST. EXTENSION
BRIDGEPORT 1, CONNECTICUT

VERSATILE *Axial Relief* GRINDING FIXTURE



For Grinding:

Cutting Edges
Steps
Flutes
Chip Relief

Grinding step on a burring tool

A grinding tool that is ideally adapted to reconditioning a great variety of cutting tools—milling cutters, burring tools, counterbores, countersinks, end mills, reamers, drills and taps—saving the expense of buying special-duty machines for grinding cutting edges, steps, flutes and chip relief.

Quickly adjusted for any operation—right hand or left hand—with automatic indexing equalized on all flutes. Can be used on both surface grinders and cutter grinders—usually with standard grinding wheels.

Send for literature explaining simplicity of operation and illustrating typical applications.

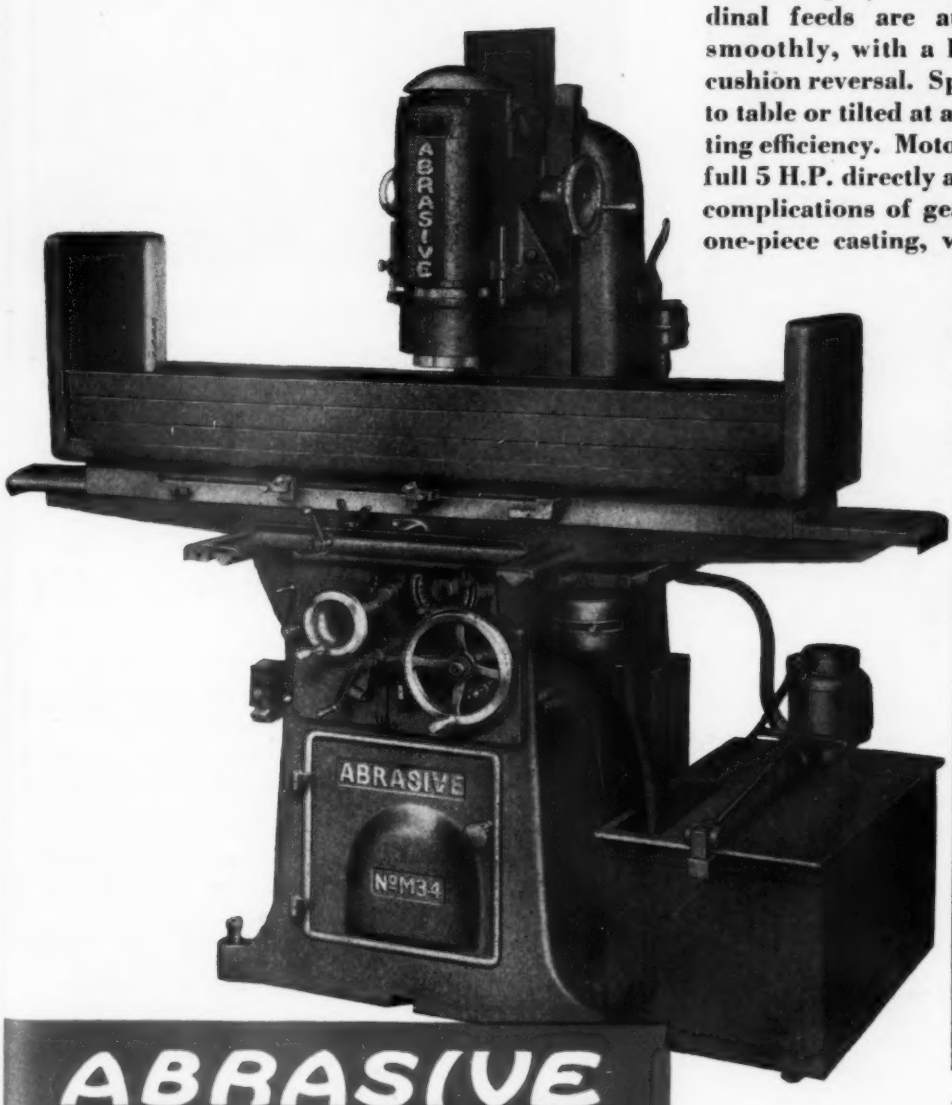
WRITE FOR Literature

GOVRO-NELSON CO.
1933 Antoinette Detroit 8, Mich.

ABRASIVE M-34

VERTICAL SPINDLE GRINDER

The M-34 gets big production grinding dies, spacers, parallels, and other flat work. Its vertical spindle design includes every feature for accuracy, maximum output, and long life. Vertical and longitudinal feeds are automatic — table reciprocates smoothly, with a hydraulic shock absorber to cushion reversal. Spindle may be set perpendicular to table or tilted at a slight angle for maximum cutting efficiency. Motorized precision spindle delivers full 5 H.P. directly at the cutting point, without the complications of gearing or belting. The massive one-piece casting, weighing 1540 lbs., is heavily ribbed to minimize vibration and insure perfect alignment throughout life of the machine. A wet grinding attachment is standard equipment on the M-34 — magnetic chucks and rotary grinding attachments are available.



SPECIFICATIONS

WORK CAPACITY:
24″ long
8″ wide
12″ high

SPINDLE:
Built-in 5 hp motor,
3450 R.P.M.
ball and roller bearing.

WHEEL SIZE:
Segment type,
6″ diam.

TABLE SIZE OVERALL:
59″ x 10½″

NET WEIGHT:
3000 lbs.

Write for Bulletin

ABRASIVE
ACCURACY BOOSTS PRODUCTION

SEE OUR CATALOG IN SWEET'S FILE

Write us for information on ABRASIVE Machines on the Government Machine Tool Surplus List . . . just send the machine serial number. We will endeavor to supply attachments, accessories, and repair parts as required.

ABRASIVE MACHINE TOOL CO., East Providence 14, Rhode Island

A master tool for industrial workmen – plant electricians, plumbers, maintenance men, garage mechanics, and even for the handyman householder.

The Star "Moly*" High-Speed Steel blade is recommended for jobs where speed and accuracy must be combined. The Star Unbreakable Special Flexible blade is ideal for all-around cutting where toughness and a certain flexibility are important.

*T. M. Reg.—Blades bearing the name "MOLY" are made only by Clemson Bros., Inc., and affiliated companies.

Sold exclusively through distributors

TRADE MARK

CLEMSON

CLEMSON BROS., Inc., Middletown, N.Y.

Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson D-17 lawn machine

RHODES

7" HORIZONTAL SHAPER

3½" VERTICAL SLOTTER

Convertible

TO A SHAPER OR SLOTTER IN 15 MINUTES

THE RHODES MANUFACTURING CO.

WALTHAM 54, MASS., U. S. A.

For cutting internal keyways, slots or splines 1/10" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Giant KEYSEATERS

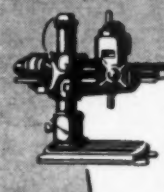
DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

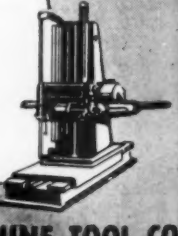
Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



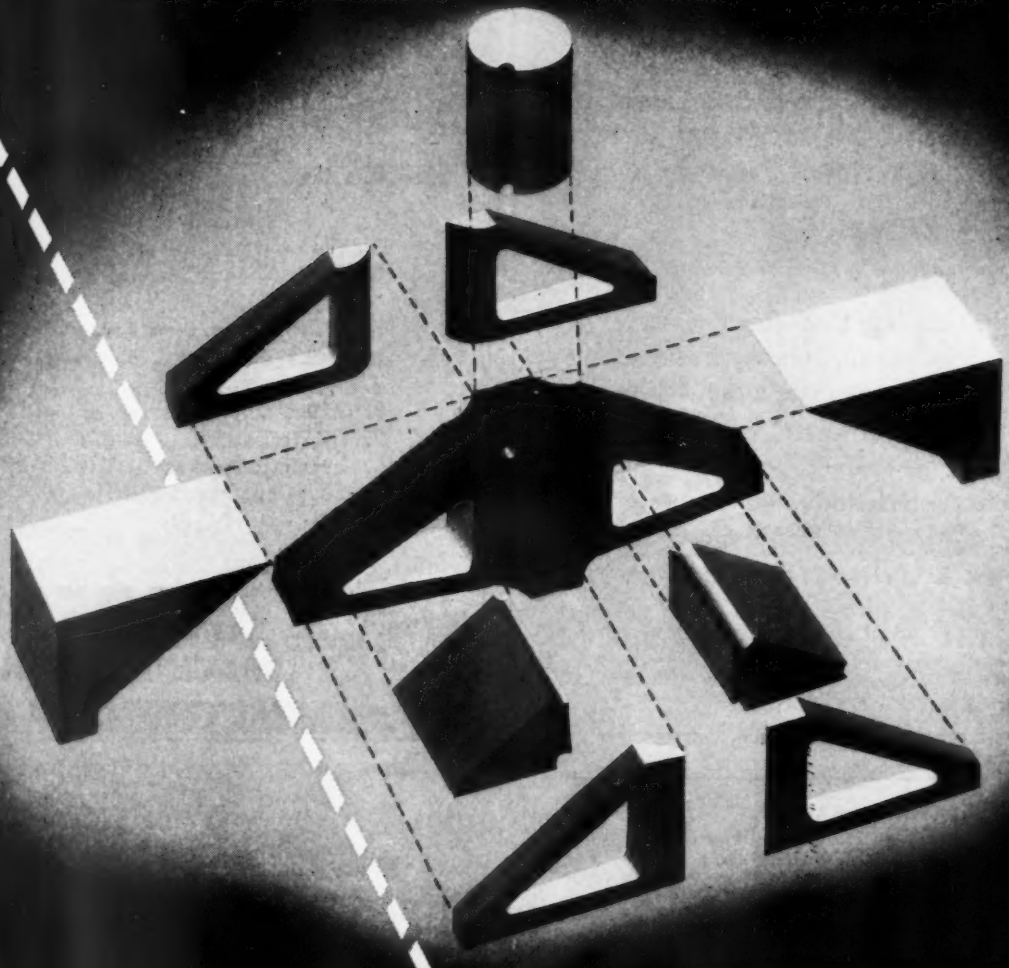
DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.

CINCINNATI, OHIO

oALL

MIRACLE METHOD OF LOW-COST PRODUCTION



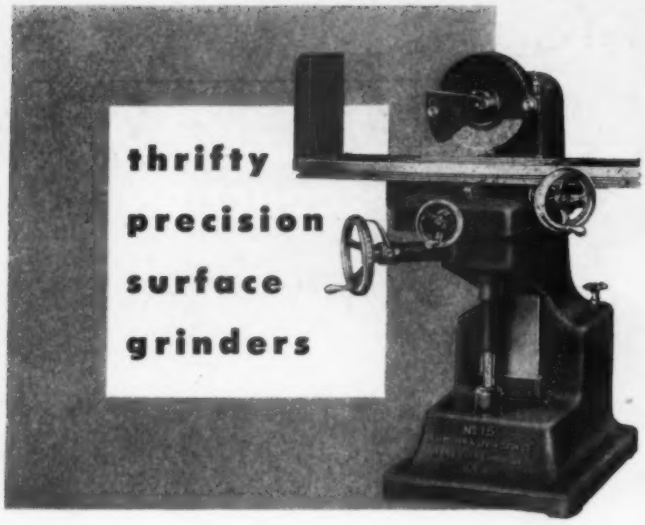
fast "slicing" *not* slow "whittling"

World's Fastest Metal-Removing Process

Countless production parts sliced to shape and size in minutes—not hours or days as with other processes. Contour Sawing leaves only a $\frac{1}{16}$" kerf—does not waste time "whittling" metal to worthless chips. Smooth power at infinitely varying speeds moves an endless band edged with razor-sharp, superhard teeth—untouchable with a file! Cutting is continuous—no wasted backstroke. Does internal as well as external cutting through tough steel up to 30" thick.

Endless applications in production, maintenance and toolroom work. A finished "casting" is cut faster than making drawings and patterns, besides saving time of casting and machining. Write for "DoALL Equals Ten Plus" which pictures advantages of Contour Sawing.

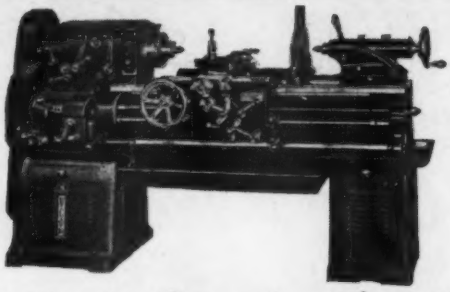
DoALL



This Grand Rapids No. 15 Motor Driven Hand Feed Surface Grinder can, in many instances, be used more profitably than the more costly Hydraulic Feed Surface Grinders . . . and we make both types.

Write for descriptive bulletin

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.



BRADFORD *Metalmaster* LATHE

features . . .

1. Oil Gages.
2. Push Button Station.
3. Three Speed-Change Levers.
4. Large Dials.
5. Offset Compound Rest.
6. Heavy Tailstock Clamp Bolts.
7. Ball Thrust Bearing.
8. Adjustable Feed Stop–Either Direction.
9. Starter in Leg.
10. Leveling Screws.
11. Sixty-four Feeds and Threads.

The BRADFORD MACHINE TOOL CO.
1840–1946 CINCINNATI, OHIO

ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS

ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All parallels fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.

ANTON PARALLELS COME IN THREE STANDARD SIZES—

- ¼" Thick x 6" Long—½" to 1-13/16" High in Steps of 1/16" $85.00 per set —22 pairs.
- ½" Thick x 6" Long—1-3/16" to 1-13/16" High in Steps of 1/16" $71.00 per set—11 pairs. $106.00 per set of 11—3 each size.
- ¾" Thick x 6" Long—1-3/16" to 1-13/16" High in Steps of 1/16" $88.75 per set—11 pairs.

Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

ANTON MACHINE WORKS

52 Sands St. Tel. TR. 5-8092 Brooklyn 1, N. Y.

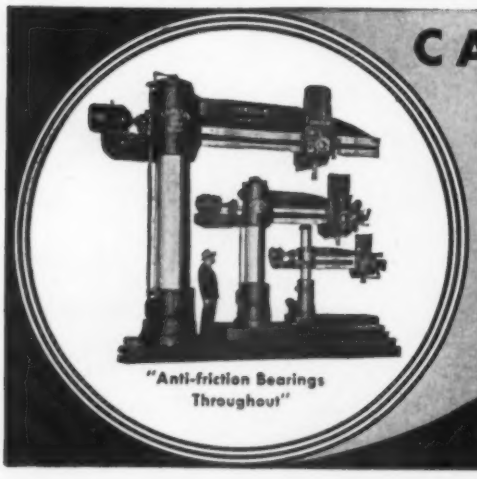
DEALERS: Morris Abrams, 196 Centre St., New York 13, N. Y., Arrow Machine Tool Co., Inc., 251 Richmond St., Providence, R. I.; Barwood Co., 3137 N. 15th St., Philadelphia, Pa. Hansen & Hasle, 135 Myrtle Ave., Brooklyn 1, N. Y.

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.



CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

NEEDED

10,000,000 STRONG RIGHT ARMS

Victory did *not* end the paper shortage. Need for waste paper is as great as ever.

Why? Because supplies must still be shipped in paper to our occupation forces and liberated countries. For the Pacific area these take double and triple wrapping to withstand long sea voyages and tropical climates.

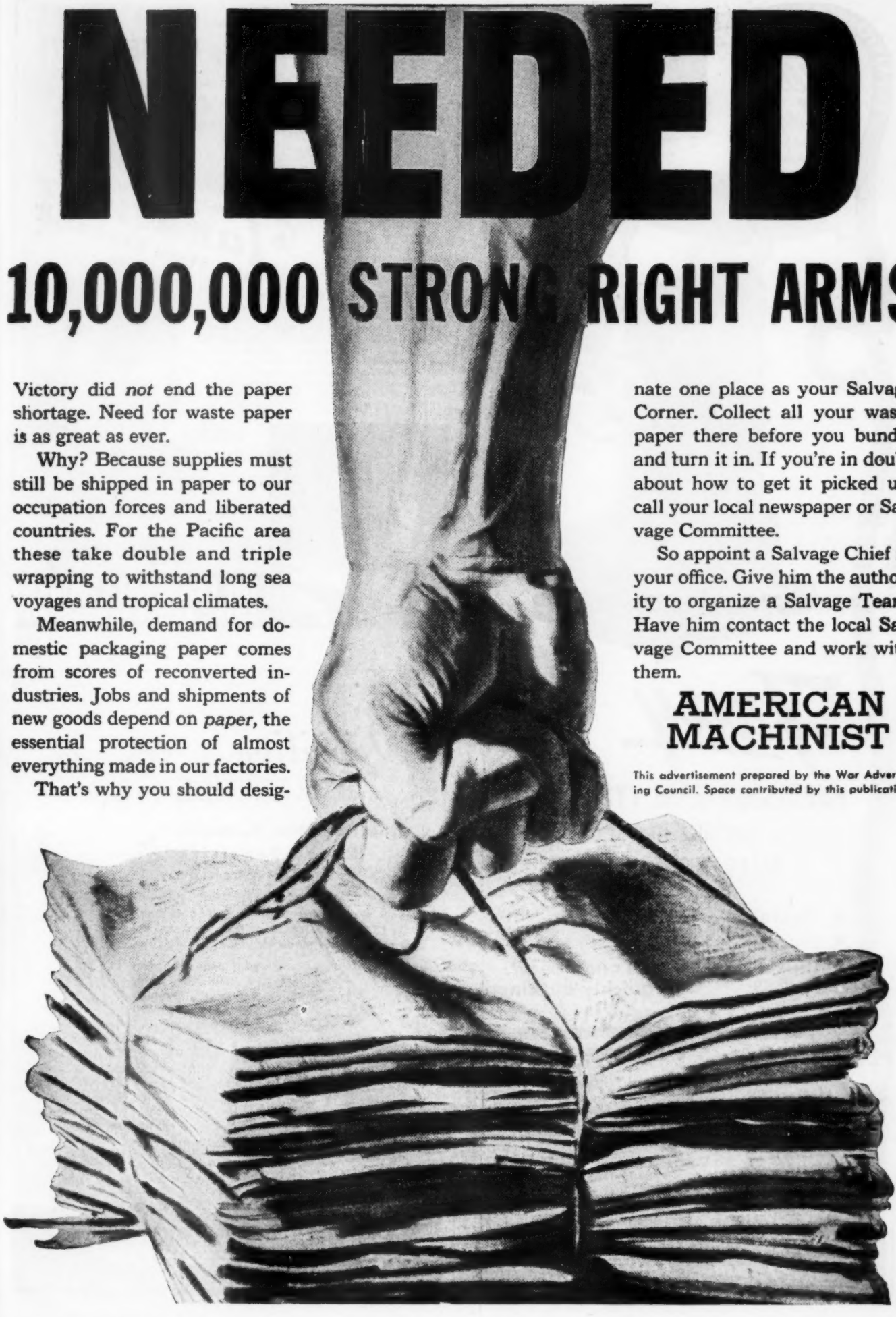
Meanwhile, demand for domestic packaging paper comes from scores of reconverted industries. Jobs and shipments of new goods depend on *paper*, the essential protection of almost everything made in our factories.

That's why you should designate one place as your **Salvage Corner**. Collect all your waste paper there before you bundle and turn it in. If you're in doubt about how to get it picked up, call your local newspaper or Salvage Committee.

So appoint a Salvage Chief in your office. Give him the authority to organize a Salvage **Team**. Have him contact the local Salvage Committee and work with them.

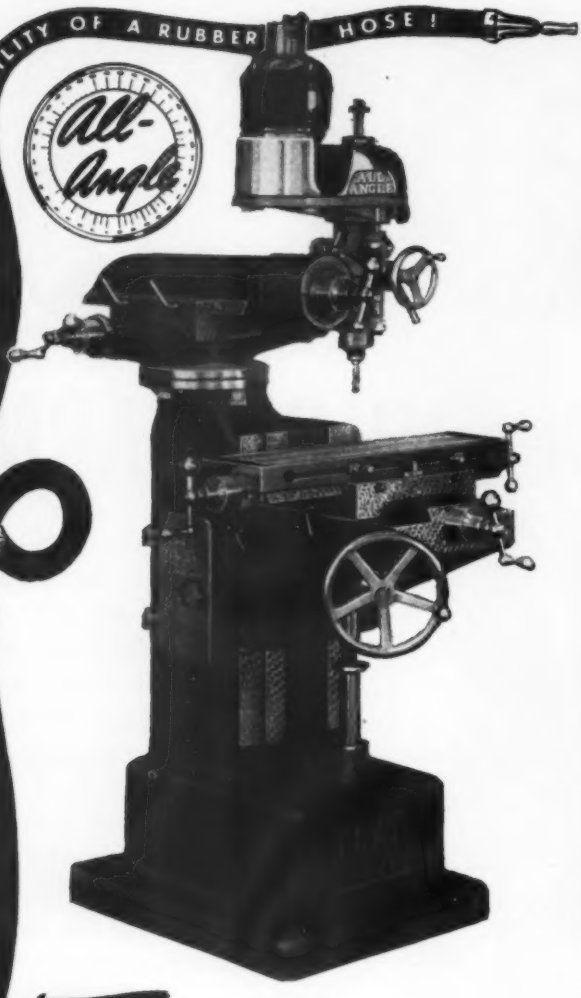
AMERICAN MACHINIST

This advertisement prepared by the War Advertising Council. Space contributed by this publication.



FLEXIBILITY OF A RUBBER HOSE!

All-Angle



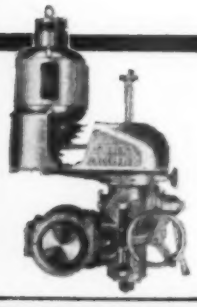
Fray

PRECISION RAM TYPE NO. 7-B

VERTICAL UNIVERSAL

MILLING MACHINE

- Flexible
- Sturdy
- Universal
- Easy to operate
- One set up
- All angles quickly obtained



- Four Sizes
- Four Types
- Adaptable to all Milling Machines

For further information write Dept. C

NATIONAL DISTRIBUTORS

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE 4, R. I.

AGENTS IN ALL PRINCIPAL CITIES

for Sawing METAL *as* HARD *as a* FILE

or Trimming FORMED PARTS

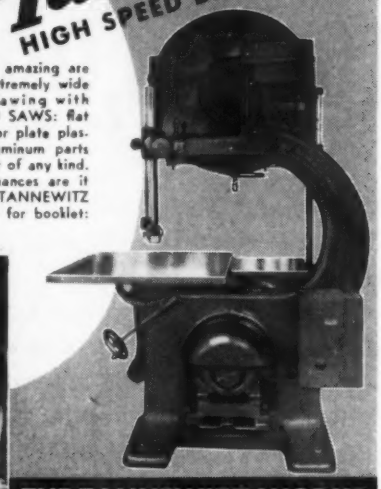
- FAST!

Actual photo of file friction sawn on Tannewitz High Speed Band Saw.

Tannewitz

HIGH SPEED BAND SAWS

Cost reductions that are downright amazing are effected in the cutting of an extremely wide variety of materials by friction sawing with TANNEWITZ HIGH SPEED BAND SAWS: flat sheets, hardened or soft steels, armor plate plastics, and many others. Formed aluminum parts can be trimmed without using a rest of any kind. Whatever your cutting problem, chances are it can be done faster and better with TANNEWITZ HIGH SPEED BAND SAWS. Write for booklet: "FRICTION SAWING."



THE TANNEWITZ WORKS

GRAND RAPIDS 4, MICHIGAN

Sensitive

and VERSATILE

The Hamilton Varimatic Super-Sensitive Drilling Machine

If your production entails the drilling of small holes (.004" to 5/16" in all drillable materials) this machine was made for you.

With infinite variation of spindle speeds, in two ranges, between 840 R.P.M. and 9300 R.P.M., instantly available by the simple use of a hand wheel and graduated speed dial; with ample clearances and travel allowances, uncanny accuracy and convenience of operation, the sensitive and versatile Hamilton Varimatic will win your confidence in one day of operation.

Write for descriptive literature containing specifications and prices. Address Department D.

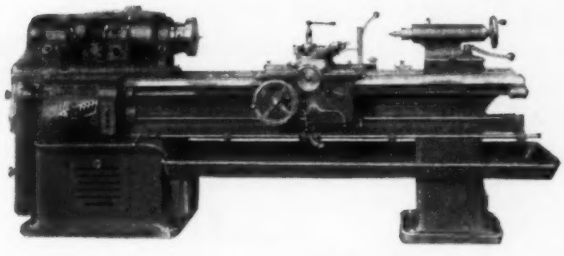
THE Hamilton TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

A SOUND PHILOSOPHY . . .

. . . that "machine tools built to the highest standards of precision workmanship will always be in demand"—has been a Hendey criterion since 1870. Today—more important than ever before—that philosophy determines the skill, care and precision with which all Hendey machines are built. We invite you to compare the productive capacity and precision of a Hendey machine with any similar machine on the market today.



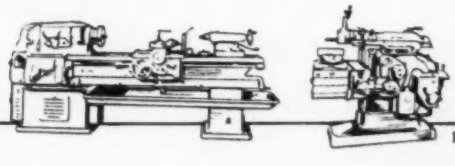
Hendey 18 speed Precision Tool room Lathe
Complete details may be had on request.

The Hendey Machine Company

Hendey

Main Office and Plant — Torrington, Connecticut

Branch Offices — New York, Chicago, Boston, Detroit, and Rochester
Representatives in — Phila., Cleveland. Los Angeles, Pittsburgh, San Francisco



TOOL ROOM LATHES
12"-16"-18"

SHAPERS
12"-16"-20"-24"-28"

DELTA-MILWAUKEE QUALITY IN A LOW-COST TOOL FOR SENSITIVE SMALL-HOLE DRILLING

DELTA MILWAUKEE

REG. U. S. PAT. OFF.

Super-Hi*-Speed Drill Press

A high-speed drill press by Delta-Milwaukee, for greater accuracy on small-hole work from .025" to 1/4" diameter — in plastics, aluminum, and other metals. Drills to the center of a 14" circle.

Embodies all the well-known construction features and operating advantages of other Delta-Milwaukee drill presses. Three-step pulley permits speed range of 12,000 . . . 8000 . . . 5000 R.P.M. Dynamically-balanced motor. Full spindle travel of 2 1/4". Specially-selected Jacobs chuck.

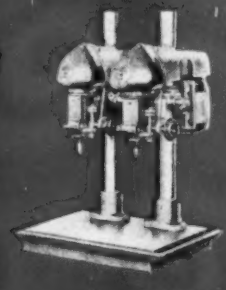
See your Delta industrial distributor for the complete story on the Delta-Milwaukee Super-Hi-Speed Drill Press.

Send coupon for Bulletin No. A-14-3.

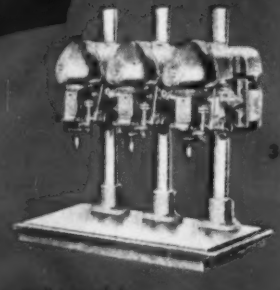
Subsidiary of Rockwell Manufacturing Co.

Single-spindle model

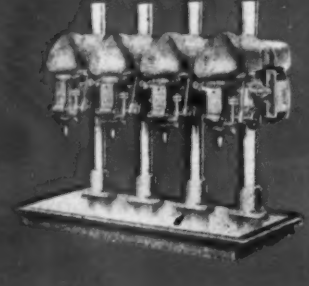
- Single-spindle model — with production table
- 2-spindle, 3-spindle, and 4-spindle models — with sectional tables
- Head, complete with motor; available separately for use on your present 14" drill press columns



2-spindle model



3-spindle model



4-spindle model

Tear out coupon and mail today!

THE DELTA MANUFACTURING CO.
609L E. Vienna Ave., Milwaukee 1, Wis.

Please send me Delta-Milwaukee Super-Hi-Speed Drill Press Bulletin No. A-14-3 and also bulletins on tools I have checked:

- ☐ Drill Presses
- ☐ Band Saws
- ☐ Abrasive Belt Finishing Machine
- ☐ Cut-Off Machines
- ☐ Toolmaker Grinders
- ☐ Tool Grinders

Name..... Position.....

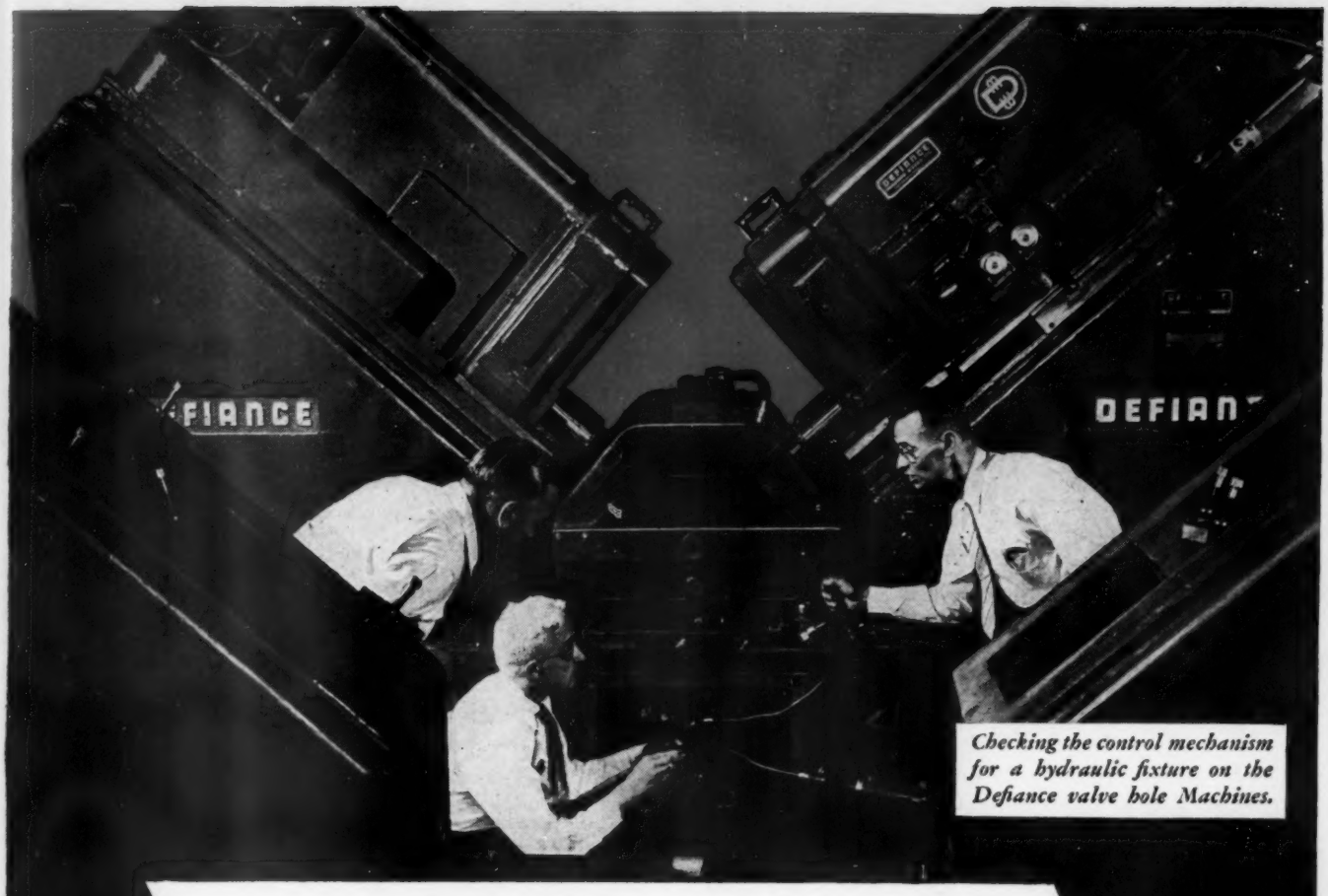
Company.....

Address.....

City..... ( ) State.....

M-19

*Trade Mark Reg. U. S. Pat. Off.



Checking the control mechanism for a hydraulic fixture on the Defiance valve hole Machines.

PRECISION

. . . IN PRODUCTION MACHINING ON V-TYPE MOTORS

Eight of these Defiance Machines in a series handle machining of valve holes and inserts in the manufacture of V-type motors. A job demanding *accuracy* in a difficult set-up!

The machines are No. 37 hydraulic units . . . mounted in pairs on columns at proper angle . . . tunnel type fixture with locating pins and clamping arrangement hydraulically operated and automatic. The first machine in the series has 8 spindles — the others, 16 spindles each. Sequence of operations is as follows: machine valve chambers and rough cut the counterbore for inserts . . . rough bore tappet holes and valve guide hole . . . semi-finish valve guide and tappet holes . . . machine valve clearance and semi-finish insert counterbore diameter . . . fly cut valve guide and tappet holes . . . line ream insert counterbore, valve guide and tappet holes . . . rough cut valve seats of inserts . . . finish cut seats of inserts.

Whatever your problem in boring—milling—drilling . . . consult with Defiance. Get *precision and efficiency* to improve quality and cut costs! Write . . . Defiance Machine Works, Inc., Defiance, Ohio.

DEFIANCE

96 YEARS OF PRECISION MANUFACTURING

Tie Your Business to the MONEY-MAKING SPEED of Air Express

NOW! THE LID IS OFF!
MORE PLANES, MORE FLIGHTS — FOR EVERYBODY
PRIORITIES NO LONGER NEEDED!

How often has your business been slowed down in recent months because you didn't get something quick — maybe, because you didn't specify delivery by Air Express!

Since a day's delay in delivery can cost a lot of money, the great speed of Air Express is actually a money-making tool. It brings your farthest-away supplier within a matter of hours from your door — and at rates which have been drastically reduced, 22% since 1943, making this service a more "economical must" than ever in the nation's business structure.

Specify Air Express-a Good Business Buy

Shipments go everywhere at the speed of flight between principal U. S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Fastest air-rail service to and from 23,000 off-airline communities in the United States. Service direct by air to and from scores of foreign countries in the world's best planes, giving the world's best service.

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AIR MILES	2 lbs.	5 lbs.	25 lbs.	40 lbs.	Over 40 lbs. Cents per lb.
149	$1.00	$1.00	$1.00	$1.23	3.07¢
349	1.02	1.18	2.30	3.68	9.21¢
549	1.07	1.42	3.84	6.14	15.35¢
1049	1.17	1.98	7.68	12.28	30.70¢
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Over 2350	1.47	3.68	18.42	29.47	73.68¢
INTERNATIONAL RATES ALSO REDUCED					

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The set of books that makes

MASTER MACHINISTS

and leads to bigger pay!

This big home-study and reference course gives you the practical facts on machines and methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency with

AMERICAN MACHINISTS' LIBRARY

6 volumes, 2516 pages, 2368 illustrations, many charts and tables

THESE books answer your questions on methods and machines—tell what you need to know about the operation of machines of all types and sizes for the whole range of metal cutting, forming, and finishing operations—show by text, diagram, and illustration the essential points of setting up work, adjusting machines, selecting feeds and speeds, determining pressures, handling materials, devising short-cuts, etc.

Puts the mastery of machine-shop work at your fingertips

With these books at hand for quick reference, no job is too hard or unusual, and the routine jobs may be improved, with savings in time and trouble and reduced wastage.

What the Library gives you

- —complete guide for everybody, from shop executive to apprentices, interested in the operation of machines used in turning and boring practice
- —description of all important varieties of machine, both manual and automatic, and methods of operating them
- —data on speeds and feeds, new cutting alloys and materials, use of coolants, etc.
- —practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work
- —training in the various operations performed in drilling and surfacing materials in the machine shop
- —exact, descriptive data on all aspects of gear-cutting practice, useful in shops of any size
- —essentials of selecting machines, setting up work, and handling operations in reaming, tapping, planing, shaping, slotting, milling and broaching.

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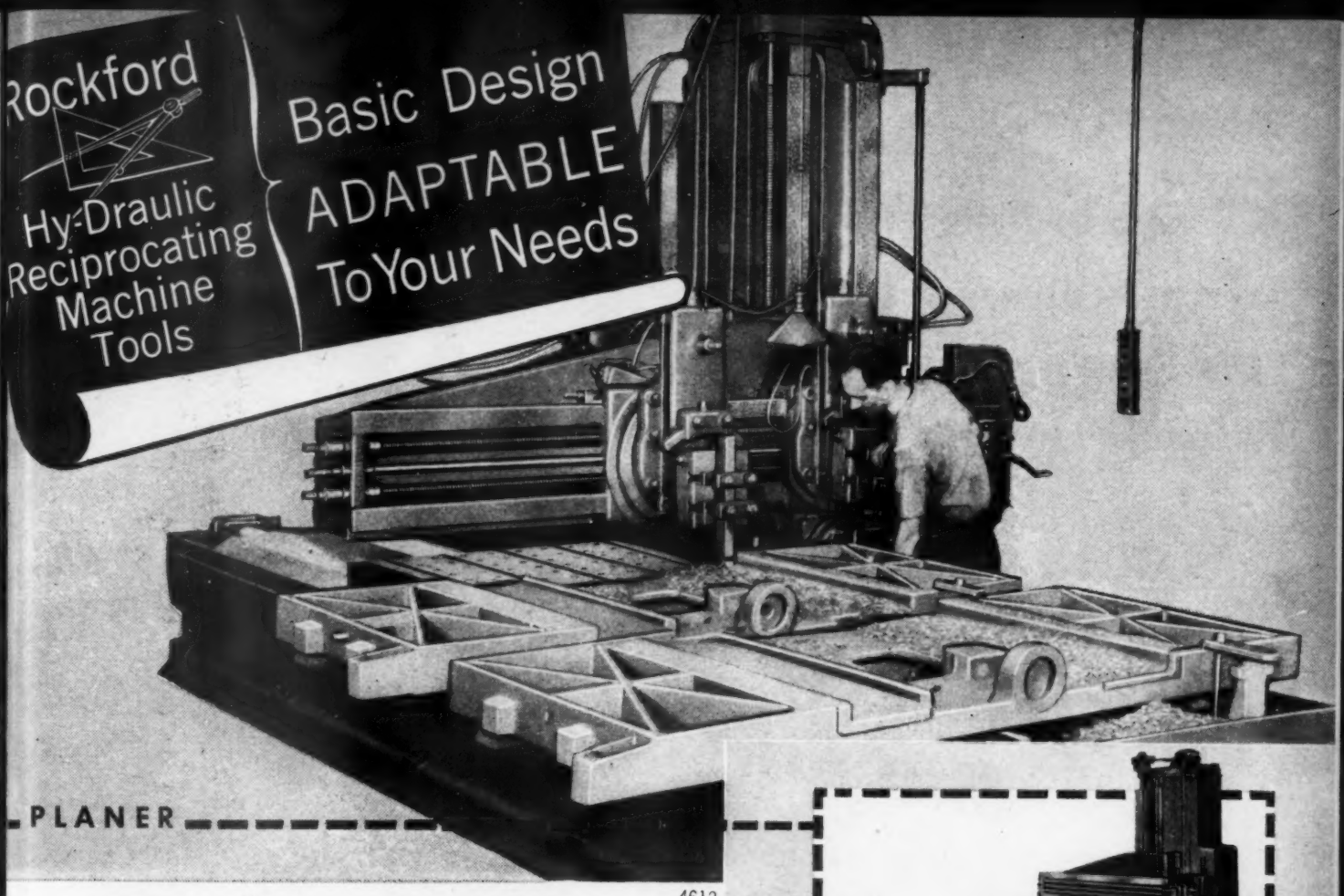


PLANER

4613

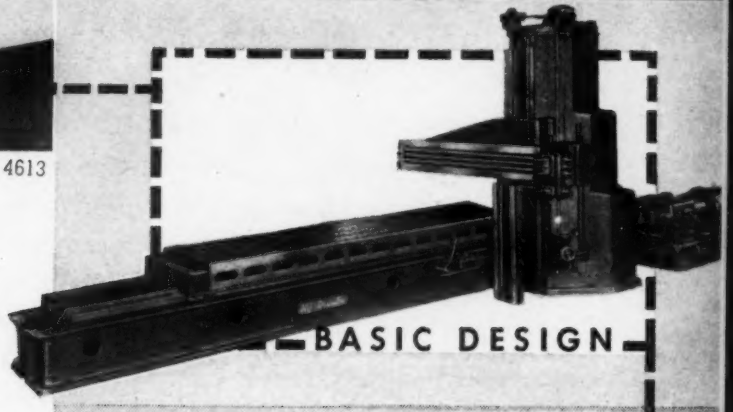
What Do You Want on the Cross Rail?

Rockford Hy-Draulic design is proving its basic soundness more fully each day. Because of it, as always, Rockford machines have powerful drives that are infinitely variable, fast, easily controlled, and smooth. Now the important feature of adaptability can be also demonstrated.

For example, the basic design of the machine shown here is normally used to build our standard Openside Planers. However, this basic Rockford Hy-Draulic design may also be applied to special machine design, such as to the grinder shown below. Whether the machine is built as a planer or a grinder, the same desirable operating advantages inherent in Hy-Draulic design are obtained.

More than ever before, machine tools today must give you better work at minimum machine time. Let us show you how a Rockford Openside Planer can improve your operations because it's Hy-Draulic. For special problems, let our engineering department show you how basic Rockford design can be applied. Rockford Openside Planers are described in Bulletin 450. Write for your copy.

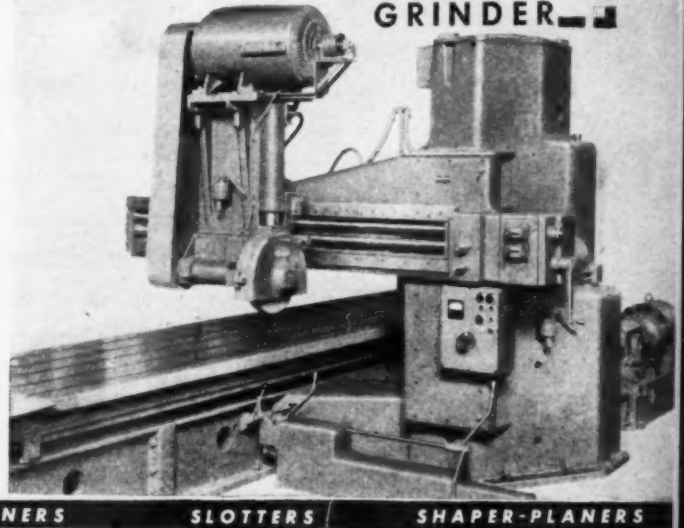
ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS



BASIC DESIGN

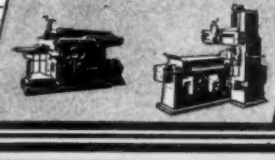
Basic design of the Rockford Hy-Draulic Openside Planer (above) is adapted to the heavy duty high-speed grinder below. Major change is that grinder head replaces tool head on the cross rail.

GRINDER

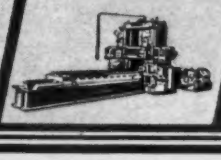


Hy-Draulic

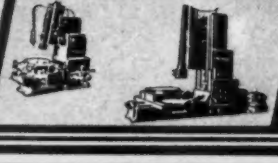
SHAPERS



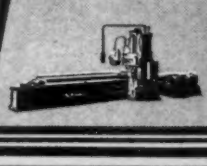
PLANERS



SLOTTERS



SHAPER-PLANERS



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You can finish almost any kind of metal except lead or babbitt to within .0001" with the Sunnen Precision Honing Machine. In addition, you can produce any commercial finish required to meet your specifications. In hardened steel, finishes can be held to .00005" on a production basis. Comparable finishes can be produced in other materials, when necessary.

These finishes can be produced in a wide range of sizes, too—from .125" to 2.625" in diameter.

This type of precision workmanship means longer life for parts, fewer rejects and greater interchangeability of closely mated parts.

The Sunnen Precision Honing Machine is quickly and easily set up—easy to operate—requires no jigs or fixtures—is low in cost and economical to use.

A Sunnen engineer will be pleased to tell you how Sunnen honing can be used to your advantage, in your plant. Call him in—or write direct for free illustrated bulletin. If you have sample parts, send them—with specifications—to the Sunnen Honing Laboratory for a test run.

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Typical Jobs

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Bearing. A very small part. 2 micro-inch finish necessary.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Compressor Yoke. Alignment maintained and better finish produced.

199

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Anti-Friction Flexible Coupling

FLEXIBILITY – *from hardened steel balls*

NO RUBBER *or* FIBRE DISCS

NO SLIDING MEMBERS

LONG LIFE

We also manufacture

FORMSPRAG—full complement over-running clutches

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Ballflex, with no rubber or fibre discs, or sliding members, achieves both angular and axial flexibility by the rolling motion of hardened steel balls. Free rolling motion in any direction eliminates side thrust and the bending or springing of parts and mounting bearings.

Accommodates parallel misalignment up to 1/8" and/or angularity up to 3°.

Ballflex requires no lubrication, being packed with lubricant and sealed at the factory for the life of the unit.

It is easily installed between two keyed flanges, without removing either flanges or shafts.

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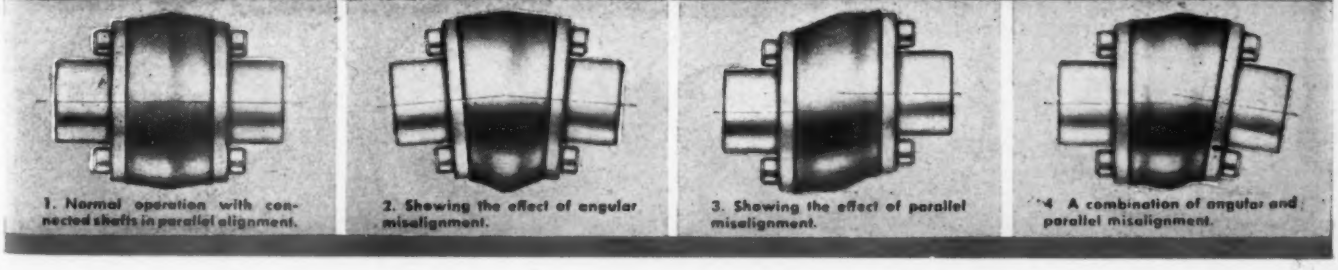
Full information, prices and capacity ratings

EXAGGERATED TO SHOW BALLFLEX OPERATION UNDER VARYING CONDITIONS



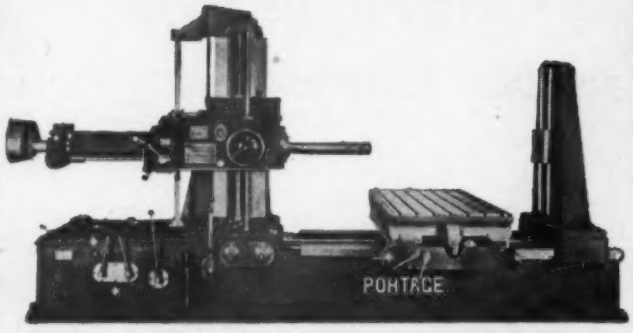
1. Normal operation with connected shafts in parallel alignment.

2. Showing the effect of angular misalignment.

3. Showing the effect of parallel misalignment.

4 A combination of angular and parallel misalignment.

PORTAGE



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• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

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. . . in your job of grinding, polishing, buffing, sanding, drilling, reaming, screw-driving or nut-setting, you want a Strand Flexible Shaft machine, because a Strand will do it faster, better, and stand up to it longer.

Strand Flexible Shaft machines provide constant speeds with greater operator convenience. Hundreds of attachments easily interchanged—125 types and sizes—models include vertical and horizontal type machines from ⅛ to 3 h.p. Distributors in all principal cities.

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DRILL 6 HOLES AT ONE STROKE!—ADJUSTABLE FOR ANY PATTERN

Multiply the production of every drill press . . . make your single spindle tools do the work of 6 with the Multi-Drill attachment. Six spindles are quickly and easily positioned to ***any*** hole pattern by simple adjustments of the locating arms. Fits any drill press. Standard Multi-Drill Spindles using 1/16" to 17/64" drill size handle any hole pattern on or within 5" circles—1 1/16" minimum centers.

SAVE:
- Drilling time
- Set-up time
- Equipment investment
- Floor space

NOTE: Special spindles are available to permit use of drills 1/16" to 3/16" diameter with corresponding minimum centers of 1/2" and 7/16".

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ADJUSTABLE TO ANY DESIGN

Proven Superiority

ECONOMY W&B CO. LUBRICANT **1888**

The *New* Lubricant for Both Grinding and Cutting

Keeps Grinding Wheels Clean and Open. Provides Excellent Rust Protection. *Mixes Rapidly—Economical.*

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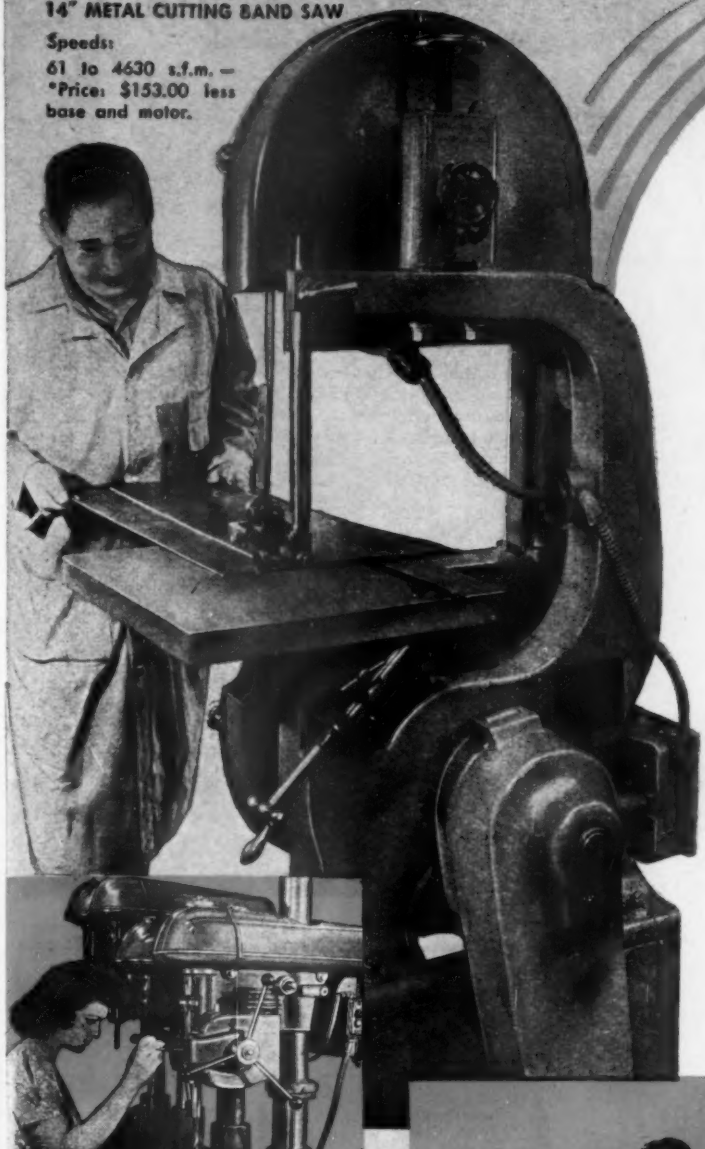
14" METAL CUTTING BAND SAW

Speeds:
61 to 4630 s.f.m. —
*Price: $153.00 less base and motor.



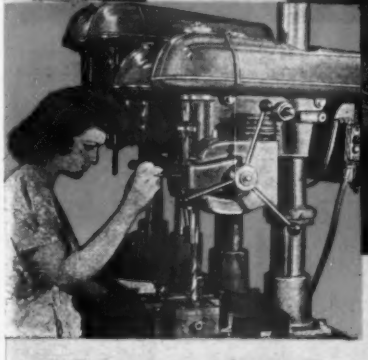
"Paid in Full"

Each of the Walker-Turner Machines shown on this page has long since "paid in full" its low initial cost in savings due to its increased production over the heavier and less flexible tools which they replaced.

In fact, the investment is so low that it is profitable to employ them as part time workers on jobs that were not completely mechanized before.

Used by the thousands on 24-hour day schedules for volume production during the past ten years, they are now being purchased to tool up for low costs in the competitive markets to come.

Plan your operations to speed up production in many directions with Walker-Turner Machine Tools—and use the guidance of your nearest Walker-Turner Distributor in helping you with the know-how.



20" 4-spindle, power feed Drill Press. Spindle travel 6". Speeds: 260 to 2600 R.P.M. with standard motors. 85 R.P.M. with special gear reduced motor. *Price: $1314.00 less motor. Available with 1 to 6 spindles, hand or power feed.

RADIAL CUT-OFF MACHINE
21½" ram travel. *Price: $446.00 with 2 or 3 h.p. geared motor, less base.

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Here's Practical Help for "Trouble Shooting" Tool Failures

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315 Pages 205 Illustrations
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Being able to "trouble shoot" tool failures —knowing how to find what's wrong and correct it, how to spot tools that might *look* all right, but may cause unnecessary shutdowns—is particularly important now. And that is one reason why "Tool Steel Simplified" has become almost the "bible" of so many men responsible for tools.

This down-to-earth, *practical* handbook goes into the subject of "trouble shooting" in a way that you can put to work right in your own shop or tool room. Tells in plain shop language such useful things as how to stop spalling in service, how to avoid heat checks, how to correct soft spots, hardening cracks, size change.

And "trouble shooting" is only one of many subjects covered by "Tool Steel Simplified". It contains usable, helpful information on every phase of tool and die making—tool steel selection, heat treating, furnace atmospheres, quenching, etc.

You can really *use* the information in "Tool Steel Simplified" to help you get better, longer-running tools—as thousands of other tool men are now doing. The book is available *at cost*, $1.00 per copy in the U. S. A. ($3.50 elsewhere). Order as many copies as you need now.

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

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MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads
Fixed-Center Auto-Reverse Multiple Tapping Heads
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

When you're figuring ways to get more production from present machines, here's something to think about:

You can increase production in such operations as drilling, tapping, reaming, milling, etc., from 40% to 500% by replacing manual feeding with Bellows Senacon "controlled-air" power feeding.

Bellows Senacon Feeds are inexpensive to buy, inexpensive to install. Precision controls provide correct feeding rates, power thrusts, etc., for almost any tool, working in almost any material.

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"One operator runs two drill presses. Increased production from 800 to 2000 per hour."

"Inexperienced operators more than doubled production on end milling operation."

"One Bellows Senacon feed operates two spindles with third spindle fed by hand. One operator for all three spindles. Production tripled."

"Bellows Senacon feed increased production on one tapping operation from 300 to 750 per hour, virtually eliminated operator fatigue."

Bellows Senacon Co.

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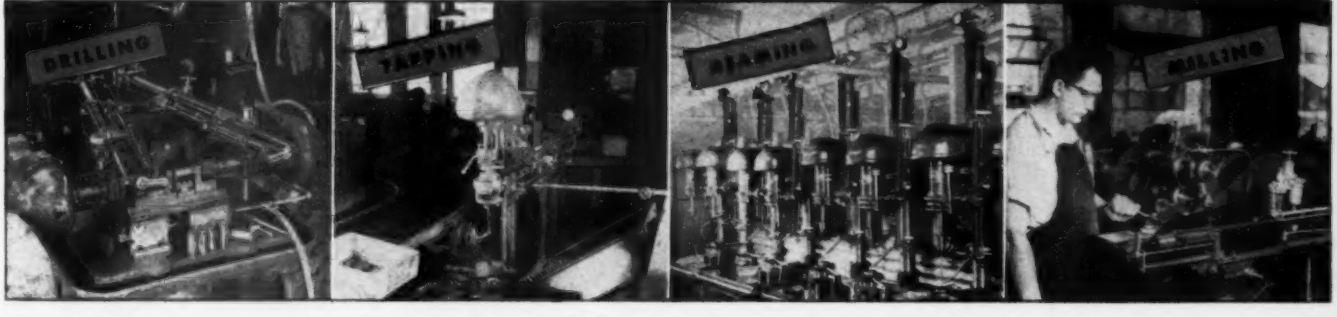

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CODOL Liquid Grinding Compound has often proved to be the primary factor in turning an unacceptable performance into a complete success. One user said: "When Codol replaced another fluid for grinding a crankshaft, wheel life jumped from 14 to 20 pieces and gumming disappeared." Says another: "Of seven compounds tested, Codol produced the best finish." And another: "Since standardizing on Codol for surface grinding, wheel and segment life has improved and rusting has been eliminated."

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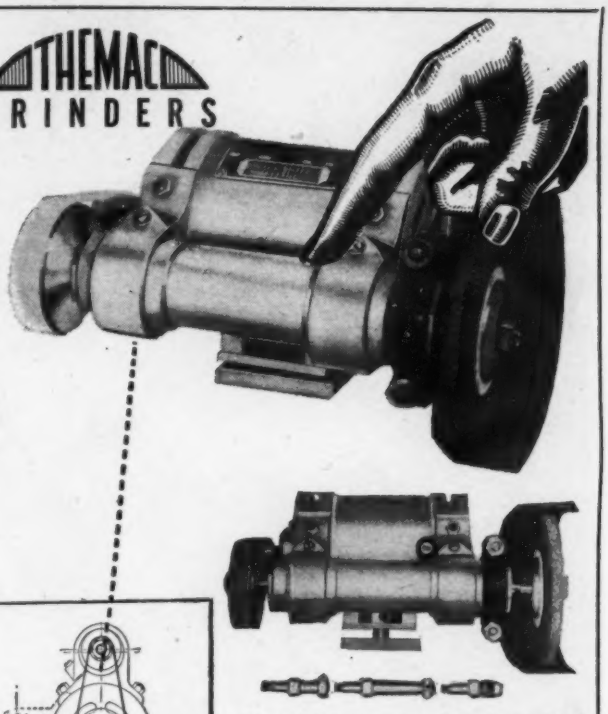
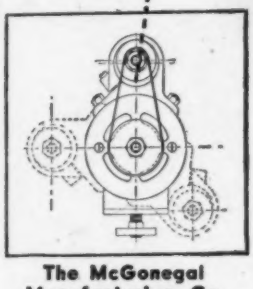
Stuart Oil Engineering Goes With Every Barrel

THEMAC GRINDERS





J-45 model does any type internal or external grinding, on any size lathe. Its interchangeable spindle extensions make this a tool of many uses.

Note the manually operated eccentric tube. This THEMAC feature provides proper belt tension.

Sketch on left shows the circumferential adjustment of Spindle Assemblies.

Write for catalog. Sold through your local mill supply distributor.

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Almond Drill Chuck

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. . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the ALMOND CHUCKS have field of drill chucks. During all these many years, continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

The Original Manufacturers of Drill Chucks

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Sterling

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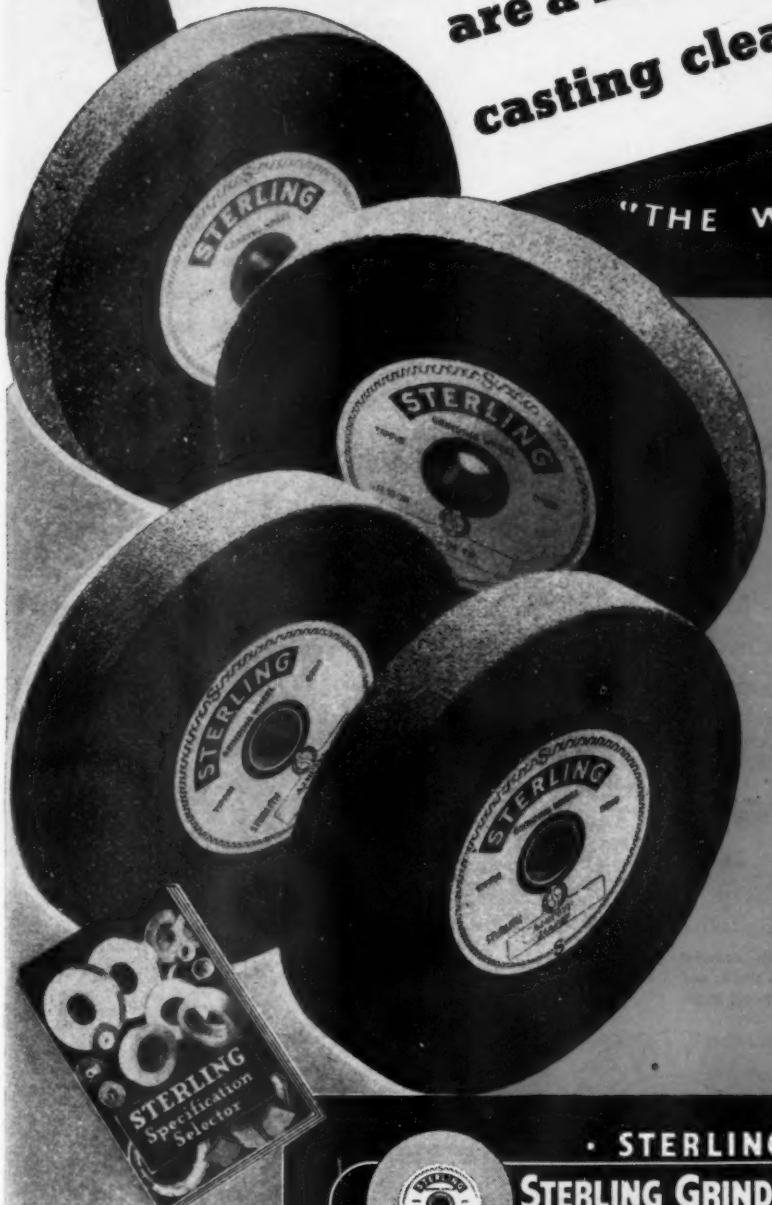
"THE WHEELS OF INDUSTRY"



Send today for the Sterling Specification Selector . . . picks the wheel you need . . . makes selection easy.

Many foundries still prefer standard speed snagging wheels for swing frame or floor stands, rather than high speed operation. For this group, extremely tough Sterling Vitrified Snagging Wheels have been developed for cool operation and fast metal removal.

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Sterling's engineers, skilled by long association with all kinds of foundry grinding problems, are ready to solve yours. Feel free to ask for this service.

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THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Yes! SKINNER AIR Chucks (WEDGE TYPE) do hold . . . even when the air fails!

Many people have asked us, and perhaps all operators wonder — "Will Skinner Power Chucks hold if the air supply fails?" To prove the outstanding design and safety features of wedge-type construction, the following tests were made with Skinner Power Chucks.

PROOF — A 10" heat-treated steel forging was gripped on the O.D. in a Skinner #1315-A8 air chuck on a single spindle automatic lathe. The chuck was operated by a Skinner #2112 cylinder. The air line pressure was 85 pounds. After gripping the work, the entire air intake of the cylinder was removed and the machine was left idle for one hour. The machine was then started and, without any further air pressure being applied, simultaneous 1/4" boring and 1/4" facing cuts were taken. The piece did not slip.

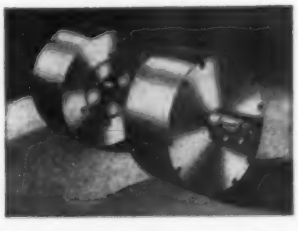
PROOF — The test was repeated under the same procedure except the forging was held on the inside diameter. A 5/16" cut was taken on the outside diameter and simultaneously a 7/32" cut was taken on the face. Again there was no slippage.

PROOF—As a further test, standard soft jaws were put on the chuck and a 2 1/4" bar, 42" long, was inserted. The chuck was closed with 85 pounds pressure on the #2112 cylinder and the air intake was removed. With the spindle turning at 252 R.P.M., a crowbar was put under the turning bar at the end. With this bar, the operator attempted to move or tip the bar and loosen the jaws, *without success.*

These tests prove that Skinner Power Chucks offer a valuable safety feature not found in all air chucks.

CONSULT YOUR SKINNER DEALER FOR DETAILS

Self-centering power chuck with three non-adjusting jaws and forged steel body. Series 3100A.



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"THE CREST OF QUALITY"

SKINNER CHUCKS

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Capacity

ONE COMPLETE ENGINE BLOCK

per minute!

Ultra-modern broaching machine built by Cincinnati Milling Machine Co. 8 tons of Circle-C used for six sets of tools.

broached with solid inserts of CIRCLE-C Super High-Speed Steel

Forty-eight flat broaches equip this enormous and powerful machine tool used for broaching and machining 8-cylinder cast-iron engine blocks.

The machine builder insisted on the finest high-speed tool steel obtainable for broach inserts.

Circle-C Super High-Speed Steel **was selected by a committee of technical experts because of its recognized reputation for quality, its uniform hardenability and its unequalled cutting capacity.**

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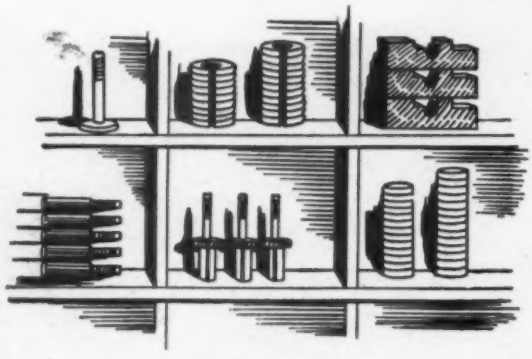
Clear Marking SPEEDS ORDER FILLING



Uniform, legible marking of a product and its component parts speeds up the filling of orders for both the manufacturer and the distributor. It establishes a workable method of stock control and recognition through the use of letter and number symbols. Clear marking eliminates time wasting guesswork and promotes good housekeeping in the stockroom.

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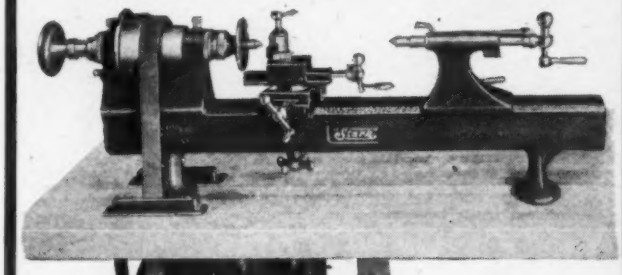
District Sales Offices: Cleveland, Cincinnati, Birmingham

Built-in infinitely adjustable drive with any speed at the turn of a convenient handwheel in front. No special bench or cabinet required. 156 to 2200 r.p.m. with Standard (toolroom) model and 220 to 3500 with High Speed (Manufacturing) model. Smooth brake and clutch. Capacity, ¾" or 1" through headstock; 9" swing, 40" length bed.

30 PRECISION ATTACHMENTS correctly designed for the very best facility and accuracy are interchangeable with all Starks of the same lathe size



OPEN CONE LATHES

Built in four good sizes, ¼" x 5⅞" swing, ½" x 7", ¾" x 9" and 1" x 9" with Stark Motor Drive Unit, the first compact, smooth under-bench drive, with 9 speeds—the full working range.

PRECISION BENCH MILLING MACHINES

Plain and spiral Models, motor-driven. Table 18" x 4", feed 10", transverse 3½", vertical over vise 4¾".

FOR EXACTING PRODUCTION it is fitted with fast lever feeds

Also "ELECTROBLAST" Muffle Furnaces

Gas fired. High speed steel temperatures in 20 minutes. Built in two small sizes.

FOR FURTHER INFORMATION, WRITE US.

Stark Tool Company

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ESTABLISHED · 1862

Originators of the American Bench Lathe

BAYFLEX RAISED HUB DISC WHEELS

are outwearing coated abrasive discs on thousands of jobs. This is really good news for foundries, welding shops, sheet metal shops, automobile and truck body repair shops, or wherever grinding and polishing of any type of welded or brazed metal is a problem.

ADVANTAGES:

1—Flat surface and edge can be used for grinding. Edge can also be used for cutting off
2—Excellent for grinding aluminum castings.
3—No "loading" under normal conditions.
4—Unexcelled for grinding into grooves and corners, and large radii on castings.
5—Will fit any standard machine using coated discs.
6—Bayflex discs, unlike coated discs, can be used efficiently right down to the nut This means time and money saved.
7—Available in a variety of abrasive grit sizes.

A trial will prove their worth. Write for bulletin for further information.

Branch offices and warehouses — Chicago — Detroit. Distributors — All principal cities

BAY STATE

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.

THIS IMPROVED MECHANICAL PROCESS

—CAN CUT YOUR FINISHING COSTS!

ROTO-FINISH

produces mechanically a surface more suitable for plating

This mechanical process produces a job comparable to hand polished and buffed parts. Roto-Finish produces this excellent surface uniformly and eliminates a large percentage of rejections.

Besides finishing and coloring, Roto-Finish de-burrs rough edges and smoothes sharp corners, giving the advantage of a completely de-burred part ready for plating.

Roto-Finish is suited to automotive, building, plumbing and household appliance hardware. It finishes parts for plating weighing a fraction of an ounce and up, of aluminum, brass, magnesium, steel, stainless steels, and die cast alloys.

In these days of increasing manpower costs, Roto-Finish is extremely economical by its elimination of hand labor. Roto-Finish speeds up production by processing quantities of parts.

Take advantage of our offer to process your parts and furnish complete information. No obligation. THE STURGIS PRODUCTS CO., 611 Jacobs Street, Sturgis, Michigan.

ROTO FINISH

THE UNIFORM MECHANICAL PROCESS—

FOR GRINDING • DE-BURRING • POLISHING • HONING • COLORING

Invitation Renewed

SEND US YOUR TOUGH JOBS!

We welcome them here — because Standard Shield Brand Drills, Reamers, Taps, Dies and Milling Cutters best prove their superior performance on difficult tasks. Uniform operating characteristics, low service costs, freedom from delays, are cost-saving and profit-increasing advantages of Standard Tools.

Our 65 years' experience in solving difficult drilling, reaming, tapping, threading and milling problems is placed at your disposal without cost or obligation. Send us your tough problems and let us demonstrate the cost reducing quality of Standard Shield Brand Tools.

"Red Shield" Brand
TWIST DRILLS
REAMERS
MILLING CUTTERS
TAPS · DIES
SPECIAL TOOLS

THE STANDARD TOOL CO.

CLEVELAND

Warehouses: New York · Detroit · Chicago

WE are all seeking to reduce costs—thus to maintain profit margins. That Standardization of operations, equipment and tools helps to reduce costs, all agree.

You can STANDARDIZE metal cutting operations by specifying STANDARD, Shield Brand Drills, Reamers, Taps, Dies and Milling Cutters.

These tools are all produced in one plant, under the same supervision and to the same quality standards. All tools in each class are alike in uniform quality and performance.

Because they are uniform in operating characteristics, workmen like to use them, and are able to better Standardize operations.

Every possible saving is worth investigating NOW. Why not investigate the saving and profit possibilities obtained by Standardizing on Shield Brand Metal Cutting Tools—viz. drills, reamers, taps, dies and milling cutters. Leading Mill Supply Distributors, coast to coast, can furnish these tools. Call your own Mill Supply Distributor, or write

STANDARD TOOL CO.

REGISTERED TRADE MARK

THE STANDARD TOOL CO.

CLEVELAND

Warehouses: New York · Detroit · Chicago

For greater *accuracy, speed* and *economy* in *your* thread cutting

MODERN

STATIONARY TYPE SELF-OPENING

DIE HEADS

Modern Self-Opening Die Heads thread diameters from 1/8" to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

PROMPT SHIPMENT....USUALLY FROM STOCK

- Wider threading range with greater flexibility. Unusually well suited to general purpose diversified threading work.
- Soundly designed and carefully built to insure maximum productiveness combined with long lasting, accurate service.
- Made with the least number of parts. Hardened and ground throughout. Wear is held to a minimum.
- Simplified design makes chaser change quick and easy. No special tools required.

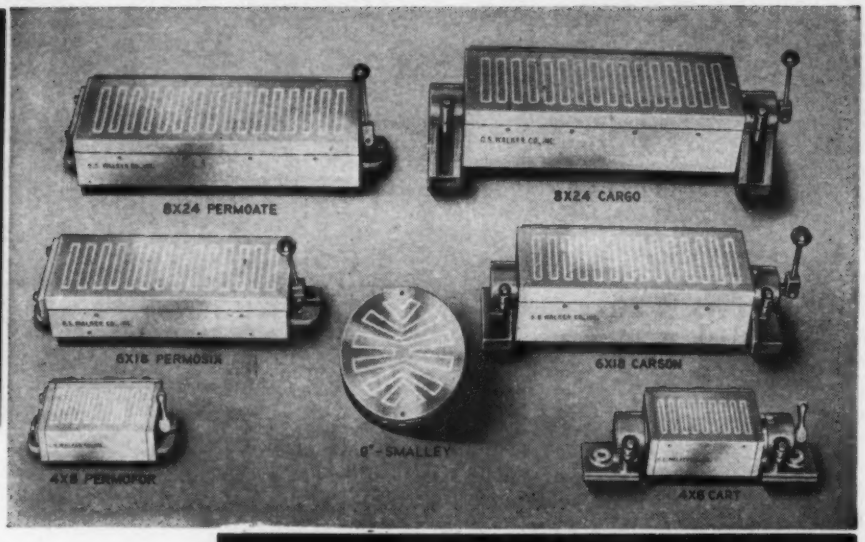
MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Walker Chucks



Truly a credit to the O. S. Walker Co., Inc.

Over 60 years of chuck building, design, and engineering experience is incorporated into these PERMOS.

WALKER ENGINEERS invite you to present your problems for solution at no obligation.

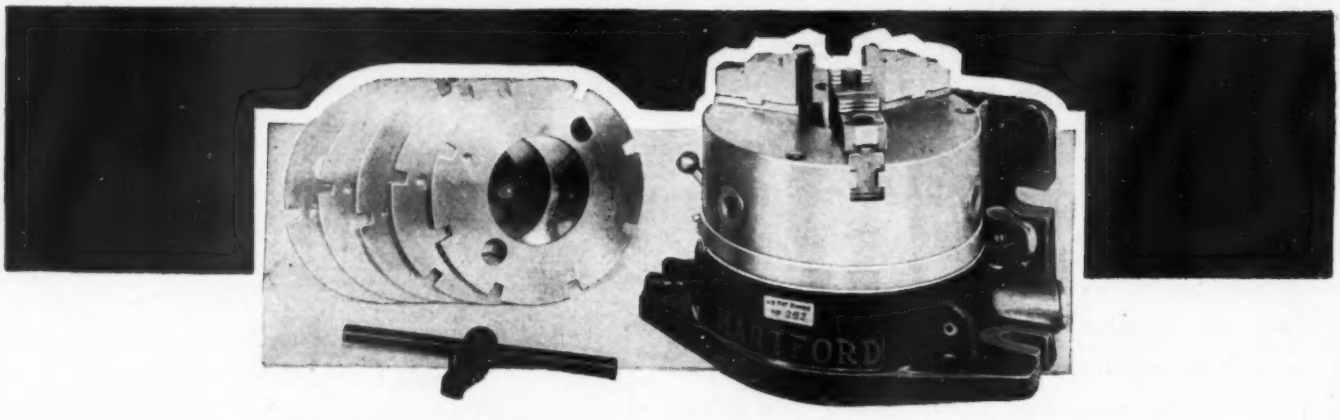
REMEMBER there is a WALKER CHUCK for every known application.

O. S. WALKER CO., INC.

Original Designers and Builders of Magnetic Chucks

Worcester 6, Mass.

This is the
WALKER
PERMANENT CHUCK
FAMILY



The HARTFORD SUPER-SPACER

assures correct spacing and foolproof indexing on a wide variety of work

Design and construction of this modern spacing device are such as to meet all requirements for fast, accurate foolproof indexing. With its attachments and fixtures the Hartford Super-Spacer will handle a wide range of drilling, boring, planing, shaping, slotting and grinding work. It is profitable to use on single pieces or in mass production. Speeds and feeds are limited only by the capacity of the holding means and the power of the machine on which it is used.

An essential and exclusive feature of the Hartford Super-Spacer are the mask plates which consist of hardened and ground master index plates provided with 16 to 36 divisions and which assure correct spacing and foolproof indexing. All chance of error is eliminated making safe and successful operation possible even in the hands of unskilled personnel.

We suggest that you send at once for a copy of our latest literature which shows typical examples of how the Super-Spacer is being used. Then outline your problem and ask us for recommendations as to how the Super-Spacer can be applied to solve it.

The HARTFORD SPECIAL MACHINERY CO. Hartford 5, Conn.

There is

SAFETY IN NUMBERS

when you

CONDITION ALUMINUM

with these OAKITE NUMBERS

10...35...61

A Good Start to a Better Finish!

Important factors that influence choice of cleaner or conditioner before preparing aluminum surfaces for painting, anodizing or other chemical treatment are: alloy composition; method of fabrication; type of cleaning equipment; nature and quantity of foreign matter to be removed; degree of cleanliness required (chemical or physical); size of part to be cleaned; heating facilities, etc. These factors deserve careful consideration in the selection of cleaning materials and techniques to assure production of a high quality, low-cost product at greatest possible speed.

To help you meet those essential requirements Oakite presents a partial list of safe-to-surface materials specially designed to remove oil, drawing compounds, rouge, lime, tripoli, and similar contaminants. Each material can be depended upon to give your product the precise degree of cleanliness without causing surface corrosion or discoloration.

FREE SERVICE . . . FREE DATA

Oakite offers you the free personal cooperation of a competent Technical Service Engineer. His extensive experience in the cleaning and conditioning of metals can be put to practical use in meeting your particular production requirements. Technical literature covering industrial cleaning in all its phases gladly mailed free on request. Write TODAY!

- **OAKITE COMPOSITION NO. 10**
  A solvent-emulsion type aluminum cleaner specifically designed for SAFE removal of carbon, grease and oil.
- **OAKITE COMPOUND NO. 35**
  Phosphoric acid type cleaner and conditioner for preparing aluminum for painting. Provides a corrosion-resistant film . . . promotes paint adhesion.
- **OAKITE COMPOSITION NO. 61**
  Scientifically formulated alkaline cleaner to speed removal of identification markings, oil, grease, shop dirt, drawing compound, etc. with maximum safety.
- **OAKITE COMPOUND NO. 34**
  Cold acid type material that in the same operation de-oxidizes and removes smut from non-clad aluminum alloys.
- **AVIATION CLEANER M**
  A performance-proved veteran among Oakite Aluminum cleaners. It is a safe-to-surface general purpose cleaner.

Oakite Products, Inc., 26 Thames Street, New York 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialized* CLEANING

MATERIALS · METHODS · SERVICE

BETHLEHEM

Tool Steel Reference List

Bethlehem tool steels range from the straight-carbon types to the highly-alloyed, special-purpose grades so often required in modern practice.

Broadly speaking, the standard Bethlehem tool steels come under seven main headings. The following list is a general guide, and it includes the steels for almost every job in your plant:

	CLASSIFICATION	TYPE ANALYSIS	TRADE NAMES
1.	General-Purpose Tool and Die Steels *(water-quenching)*	C or C-V. 0.70 to 1.40 carbon range	X; Best; XCL; Superior; XX
2.	Safe-Hardening Tool and Die Steels *(oil-quenching)*	Mn-Cr-W-V Ni-Cr-Mo	BTR Bethalloy
3.	Air-Hardening Tool and Die Steels *(air-quenching)*	Mn-Cr-Mo	AH; AH-5
4.	High-Production Tool and Die Steels	High C, High Cr	Lehigh L; Lehigh H; Lehigh S
5.	Shock-Resisting Steels	Si-Mn W Cr-V	No. 71 Alloy; Omega No. 67 Chisel Tough (H and M tempers)
6.	Hot-Work Steels	Cr-Mo W	Cr-Mo-W; Cr-Mo-V No. 57 Hot Work; No. 57 Special Hot Work
7.	High-Speed Steels	W W-Mo	Bethlehem Special High Speed; Comokut; Red Tiger (Improved) 66 High Speed; Moco; HM

Remember, our specialists are always ready to talk applications with you. Call us when tool-steel problems get tough—or better still, let us work with you from the start.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Bethlehem tool steels for every purpose

BETHLEHEM STEEL

Over 200 railroads in the United States use Gulf lubricants and fuels —and get the benefit of the co-operative service extended by Gulf's trained lubrication engineers.

The recommendations and practical suggestions of Gulf Lubrication Engineers are adopted by scores of leading power plants in 30 states from Maine to New Mexico.

Gulf Lubrication Engineers consult regularly with textile mill officials and operating men to help insure efficient production and low maintenance costs.

The paper mill Superintendent in the picture says, "We get greater tonnage and keep maintenance costs down by following Gulf Engineering recommendations."

Gulf Lubrication Engineers are welcome visitors in hundreds of coal mines as they make their periodic calls to insure efficient lubrication and lower operating costs.

Adopt

Gulf Periodic Consultation Service

to insure efficient lubrication the year-round, lower costs—

HERE are two easy steps you can take to help keep your plant up to maximum efficiency: Call in a Gulf Lubrication Engineer and let him work with your operating and maintenance men to install improved lubrication practice; then adopt Gulf Periodic Consultation Service to insure efficient lubrication the year round.

After you adopt this practical, money-saving plan, a trained Gulf Lubrication Engineer will make periodic service calls at your plant. He will make additional recommendations to meet changed conditions and keep your plant men informed on latest developments in lubricants and application methods. At all times he will seek to further improve your lubrication practice, increase production, and reduce costs.

Act now to get the many benefits that can be obtained through Gulf Periodic Consultation Service. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
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GULF INDUSTRIAL LUBRICATION

Helps make machines produce more at lower cost

Willson Makes NEWS In PLASTIC EYE PROTECTION

NEW FeatherSpec

For Light Grinding, Wood Working, Spot Welding and Similar Jobs

Here's the solution to the problem of keeping safety spectacles on workers in semi-hazardous jobs—the new Willson FeatherSpec. So light in weight (less than an ounce) it can be worn all day long with complete comfort—even over regular glasses.

FeatherSpec furnishes 2-way eye safety—from impact hazards and from glare. The large one-piece lens provides wide angle vision as well as high frontal impact strength. The special "suspension-lock" frame holds the lens firmly in position, yet permits replacement in ten seconds!

Give your workers the benefit of FeatherSpec's new comfort and extra protective features. Available in two lens shades—clear or the new Willson Tru-Hue green, which keeps out glare without color distortion.

MORE PROTECTION WITH PLASTICS

WILLSON MONO-GOGGLE—Made of shatterproof plastic for over-all eye and nose safety. MonoGoggle wearers get extra comfort because of light weight, rolled contact edges, adjustable headband. Clear or Willson Tru-Hue green lens. May be worn over glasses.

WILLSON PROTECTO-SHIELD*-Furnishes full-time safety for both front and sides of face. Lightweight, snug-fitting, comfortable. Tilted visor available in three lengths. Clear or Tru-Hue green plastic.

For help with your eye protection problems, consult your Willson distributor or write to Willson Products, Inc., 235 Washington St., Reading, Pa.

*T. M. Reg. U. S. Pat. Off.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON

PRODUCTS INCORPORATED

READING, PA., U. S. A. Established 1870

Patented

HY-CO CENTER-DRILLS

WILL SAVE FOR YOU, TOO!

Unbelievable savings are reported by every shop using the new, Patented HY-CO Center Drills. Send for proof in booklet—"A Winner 4 to 1." See how "tip clearance" helps prevent center drill breakage; why "HY-CO Center Drills" have no fatigue point; how LINE CONTACT with the Center abolishes out-of-round work. Send card with name and company for booklet to Dept. AB.

PATENT No. 2,403,861

NO MORE Push-Pull-Lift-Lug

Modern materials-handling methods are rapidly cutting down the physical effort once necessary in manufacturing activity. Cranes and conveyor systems; lift trucks and hoists . . . these and other sweat-savers are reducing costs while production rises.

If you'd like to know more—copies of "Modern Materials-Handling Methods", *American Machinist's* Special Report for June 20th are still available in limited quantities. We'll be happy to fill your order. 15¢ a copy—13¢ in quantities of 50 or more.

AMERICAN MACHINIST

330 West 42nd Street
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LATHE OUTPUT *Increased Up to 25%* with IDEAL LIVE CENTERS

PREVENT BURNING of WORK and CENTER

"Lathes are running 10% to 20% faster and output being increased up to 25% on most jobs with Ideal Live Centers" says a large manufacturer of fibre products; who also reports that "burning" of the fibre, formerly caused by the friction heat generated between the dead centers and the work, has been entirely eliminated.

IDEAL Live Centers increase production and reduce costs because they permit machines to run faster and take deeper cuts. IDEAL Live Centers rotate with the work, on ball and roller bearings, preventing friction heating and burning of work or center. They save the frequent delays to machines to replace dead centers, save set-up time, as well as the replacement cost of fast-wearing dead centers.

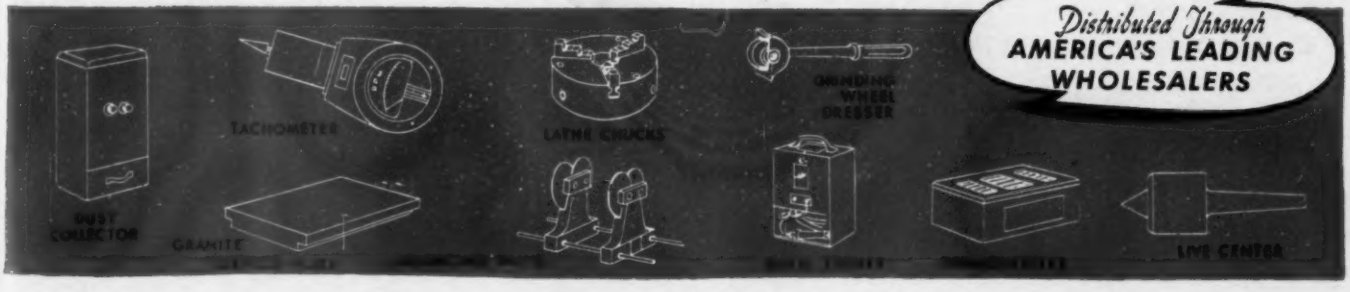
No matter what materials your lathes work on, it will pay you to get the facts on IDEAL Live Centers. Our catalog of IDEAL Live Centers and other Machine Tool Accessories will be sent promptly on request.

IDEAL INDUSTRIES, Inc.

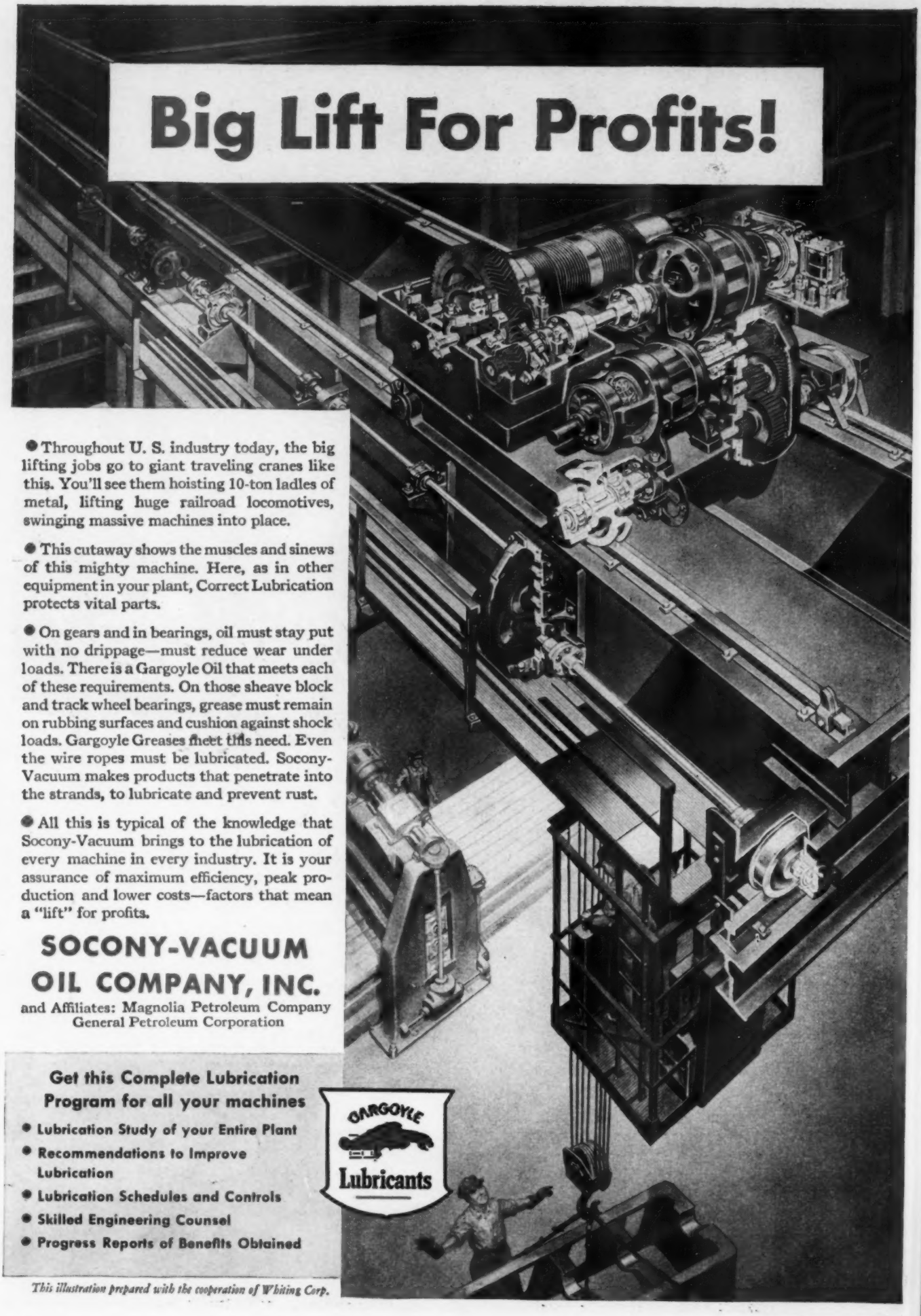
(Successor to Ideal Commutator Dresser Co.)

1057 PARK AVENUE SYCAMORE, ILLINOIS

1993



Big Lift For Profits!



● Throughout U. S. industry today, the big lifting jobs go to giant traveling cranes like this. You'll see them hoisting 10-ton ladles of metal, lifting huge railroad locomotives, swinging massive machines into place.

● This cutaway shows the muscles and sinews of this mighty machine. Here, as in other equipment in your plant, Correct Lubrication protects vital parts.

● On gears and in bearings, oil must stay put with no drippage—must reduce wear under loads. There is a Gargoyle Oil that meets each of these requirements. On those sheave block and track wheel bearings, grease must remain on rubbing surfaces and cushion against shock loads. Gargoyle Greases meet this need. Even the wire ropes must be lubricated. Socony-Vacuum makes products that penetrate into the strands, to lubricate and prevent rust.

● All this is typical of the knowledge that Socony-Vacuum brings to the lubrication of every machine in every industry. It is your assurance of maximum efficiency, peak production and lower costs—factors that mean a "lift" for profits.

SOCONY-VACUUM OIL COMPANY, INC.

and Affiliates: Magnolia Petroleum Company
General Petroleum Corporation

Get this Complete Lubrication Program for all your machines

- Lubrication Study of your Entire Plant
- Recommendations to Improve Lubrication
- Lubrication Schedules and Controls
- Skilled Engineering Counsel
- Progress Reports of Benefits Obtained

GARGOYLE Lubricants

This illustration prepared with the cooperation of Whiting Corp.

UNITED STATES PRODUCTS CO.

LAPPING and GRINDING COMPOUNDS

Call Upon Our **15 Years** Experience For Help in Solving Your Problems

There is no substitute for experience. During a fifteen year span devoted *exclusively* to serving industry with ready-mixed abrasive compounds, we have been required to produce a wide range of compounds for all kinds of lapping and grinding operations. Many of our present standard compounds were originally "specials", developed to solve some particular problem that was troubling a shop.

May we share with your shop our knowledge based upon 15 years of experience acquired in studying, diagnosing and prescribing for lapping troubles. We welcome the opportunity to work with production men in recommending the proper compounds for any particular operation.

* * *

Below are described a few of the U. S. Products compounds and applications that are being successfully handled by them. If you have similar applications, use the coupon to secure a generous free trial sample.

GEARS

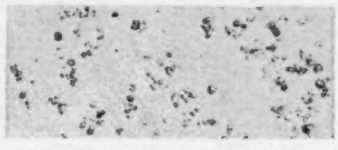
HARD or SOFT
HYPOID - BEVEL
SINGLE and DOUBLE HELICAL

Used by leading gear manufacturers. A special paste base lapping compound made expressly for gear lapping.

Economical, Convenient, Safe

Twelve different grades for lapping largest to smallest gears.

Grade NO. 38-1200 FINEST GRIT COMPOUND ON THE MARKET



MICROPHOTOGRAPH, 500 TIMES ENLARGED, SHOWING UNIFORM GRAIN STRUCTURE

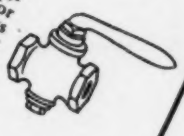
A premium product for premium work. Contains an exclusive U. S. Products Company abrasive so fine that it is not necessary to embed in lapping plates. Average granule size 2—3 microns. One micron is equivalent to 1/25,000th of an inch.

PLUG COCK VALVES

BRASS or STEEL

A special water soluble compound for brass that does not "niggard or score."

Bought in quantity by many leading manufacturers. We have a superior compound for grinding angle cocks and pressure holding surfaces. Adopted by many maintenance departments for railroad angle cocks.



PRECISION LAPPING

- HAND
- PLATE
- MACHINE

FREE

Finer quality, finer grit, lapping compounds. Prove them on your own operations at our expense. Trial carton containing six 1-oz. sample jars sent FREE. All fine grit sizes best suited to a variety of precision work. *Use the coupon.*

USP Co

Ask FOR FREE TRIAL SAMPLES

Use this COUPON!

UNITED STATES PRODUCTS COMPANY
518 Melwood Street Pittsburgh, Pa.

Gentlemen:

I am interested in trying your compound for (check application) GEARS ☐ BRASS VALVES ☐ STEEL VALVES ☐

Send sample of your GRADE NO. 38-1200 ☐

Send trial PRECISION LAPPING COMPOUND KIT ☐

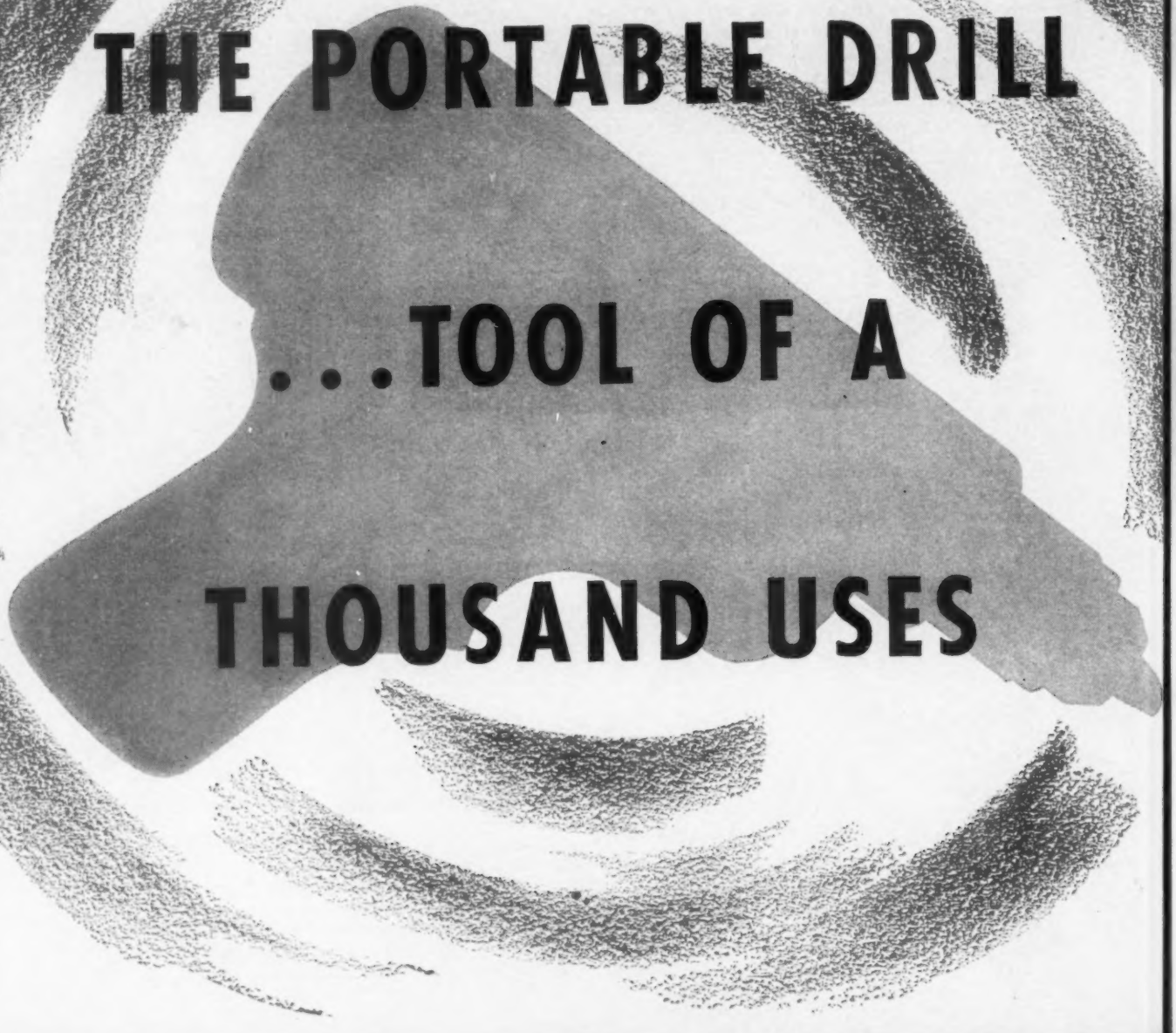
NAME _____

BUSINESS CONNECTION _____

STREET _____

CITY _____ *STATE* _____

EVERY ONE...



THE PORTABLE DRILL

...TOOL OF A

THOUSAND USES

"IF IT'S A JACOBS, IT HOLDS"

Jacobs

WITH ALL LEADING PORTABLE DRILL* MANUFACTURERS IN AMERICA, THE STANDARD IS .....

Jacobs Chucks

This overwhelming preference throughout an industry is substantial proof of the practical design, consistently accurate performance and complete reliability of Jacobs Chucks. Backing the aim to make these the world's best chucks are such qualities as . . .

Nickel alloy steels for strength and toughness – Areas subject to wear carefully surface hardened – Lands are heat treated for extreme hardness but with adequate core strength retained – Grip sleeves are simultaneously ground internally on three dimensions for balance – Tools can be readily changed and are always accurately centered with a sure grip – Minute tolerances permit ready interchangeability.

In your shop – or in your product – make Jacobs Chucks your first choice because "if it's a Jacobs, it holds!"

Jacobs Plain Bearing Key Chuck

*Electric and air driven

Chucks

THE JACOBS MANUFACTURING COMPANY
Hartford, Connecticut

USERS AVERAGE 25% SAVINGS ON FILING COSTS

with *American Swiss Files*

To bring about long-term economy in file costs, it is important to use the files that combine greatest durability with speediest and most accurate work. According to enthusiastic users, "AMERICAN SWISS" Swiss-Pattern files, by their superiority in these three essentials, produce average savings of 25%.

When *"wear-ability"* counts, "AMERICAN SWISS" files make savings by lasting longer. Made of only the highest grade file steel and specially heat-treated to assure uniform hardness, they stand up under heavy work and rough treatment.

When *performance* counts, "AMERICAN SWISS" files pay off in speed and accuracy. Their clean, sharp, precision-cut teeth speed operations. A selection from the 3000 shapes, sizes and cuts—some made to tolerances as close as .002 in.—makes it possible to find the file exactly suited for the job. When the work is intricate or when one file must be identical to another, "AMERICAN SWISS" accuracy and uniformity can be relied upon.

To assure real savings, standardize on "AMERICAN SWISS" . . . the Swiss-Pattern files that *outlast* and *"outfile"* all others.

Buy From Our Distributor

AMERICAN SWISS FILE & TOOL CO., ELIZABETH 1, N. J.

ASK FOR THEM BY NAME

American Swiss

ONLY THE BEST

SWISS PATTERN FILES

The New

METRO

Heavy Duty Carbide Expanding REAMERS

WITH FULL-LENGTH CARBIDE BLADES

Straight or Taper Shank Heavy Duty Reamer

Heavy Duty Shell Reamer

For modern high-speed production, choose Metro Heavy Duty Straight, Taper Shank and Shell Type Reamers with full-length carbide blades—created especially for the most modern machines—for faster, cleaner production.

Precision made—heat-treated alloy steel bodies, chrome plated. Low expansion angle lessens O. D. grinding when resharpening. Limited blade overhang (1-16") increases rigidity without loss of chip clearance. Shell arbors furnished with straight or Morse taper shanks. Made by the makers of the well-known Metro Precision Gages and Carbide Tipped Tools. Send today for descriptive literature and name of nearest distributor.

METRO Tool and Gage Company

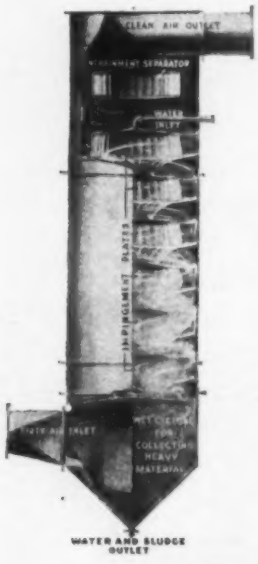
4240 W. PETERSON AVE., CHICAGO 30, ILLINOIS

LIQUIDATE
YOUR DUST AND FUMES!

Four Schneible 20,000 c.f.m. Senior Multi-Wash Collectors at a large metal-working plant, which has since ordered two more.

WE DO mean "liquidate"—in the sense of finality, and we refer to the Schneible wet method for eliminating contaminated air.

It is definitely profitable to install the most effective equipment for dust control throughout the plant, with due consideration for operating and maintenance costs. Clean air pays dividends. Schneible Multi-Wash equipment has proved so effective for dust and fume control that it is used by manufacturers everywhere.



For disposal of the dust, nothing equals the Schneible wet method. Schneible Multi-Wash Collectors use water to wash dust and fumes from the contaminated air. The collected matter, as sludge, flows to a dewatering tank (or waste). The sludge is settled out and the cleared water is re-circulated.

In operating and maintenance costs, a Schneible system is the absolute low. No attendance required. No bags or filters to shake daily or replace. No moving parts; nothing to break, clog, burn or rapidly wear.

Practically every dust and fume condition can be effectively controlled with standard Schneible units.

Send for informative bulletins.

CLAUDE B. SCHNEIBLE CO.

2827 Twenty-fifth St., Detroit 16, Mich.

Engineering Representatives in Principal Cities

SCHNEIBLE

Just ONE setting per form
Just ONE continuous motion

"Fluidmotion"
FEATURES:

.0001" accuracy • Automatic Centering "Fluidmotion" dressing • Dustproof and chatterless hardened stainless steel 7" & 14" wheel capacities • Highest quality diamonds.

Prominent users tell us that they consider "Fluidmotion" Radii & Angle Dressers the finest precision dressing instruments procurable—regardless of cost. They obtain greater accuracy, longer wheel life, and much faster setup and operation.

We'll be glad to send you complete information. Write.

*Reg. U. S. Pat. Off.

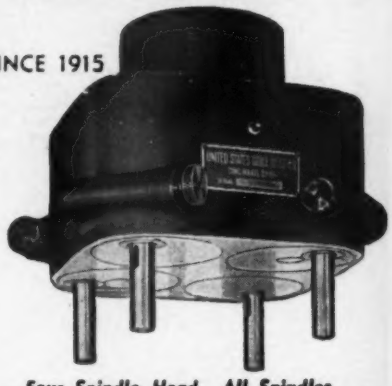
J & S TOOL CO. 477 Main St. East Orange 1, N. J.

Representatives in Principal Cities

STANDARD US HEADS SINCE 1915

All Types of Fixed Center

DRILLING TAPPING & BORING HEADS



Four Spindle Head. All Spindles Adjustable for equally spaced holes.

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS

AT THE METAL SHOW

. . . make a point of seeing the latest developments in

HARDNESS TESTING

ACCO "ROCKWELL" HARDNESS TESTER *Made Only by Wilson* ★ TUKON TESTER for KNOOP HARDNESS NUMBERS

WILSON MECHANICAL INSTRUMENT CO., INC.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

357 CONCORD AVE., NEW YORK 54, N. Y.

Food Machinery · Pacific Supply

Both Use SMITHway *Certified* Electrodes

Welding stainless steel reel caps on a Food Machinery pressure cooker

Food Machinery Corporation, Anderson Barngrover Division, San Jose, Calif., manufactures continuous pressure cookers and coolers used widely by the food-processing industry in canning fruits, vegetables, evaporated milk, meat and fish products. An exclusive user of SMITHway Stainless Electrodes (SW-159), they know that their proof is in plant production—*and in service.*

A Pacific "Groundplane" bucket being welded with SMITHway Electrodes

Pacific Supply Company, South Gate, Calif., uses SMITHway Electrodes (SW-11, 15, and 35) in the manufacture of its scientific land-leveling "Groundplane." They know from experience that the continuous welding research of the A. O. Smith Corporation is built into SMITHway *Certified* Welding Electrodes, making them a better production tool —for *all* kinds of jobs in *all* kinds of plants.

SMITHway *Certified* Welding Electrodes—Made *by* Welders . . . *for* Welders

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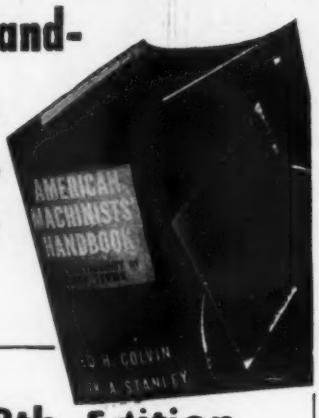

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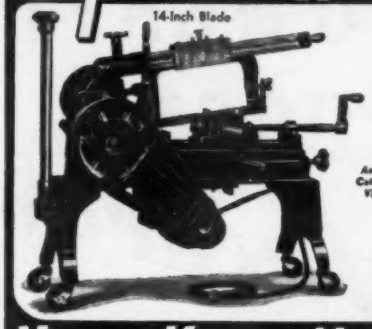

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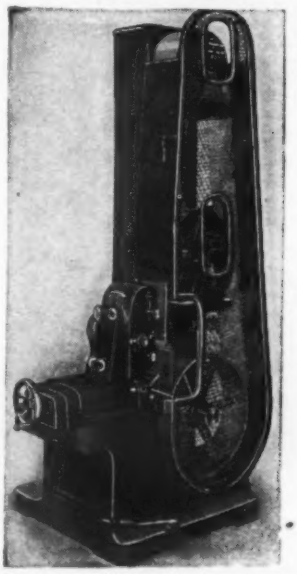

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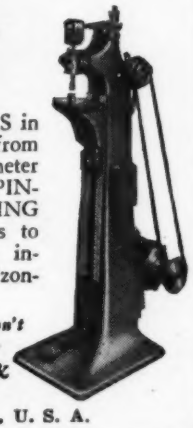

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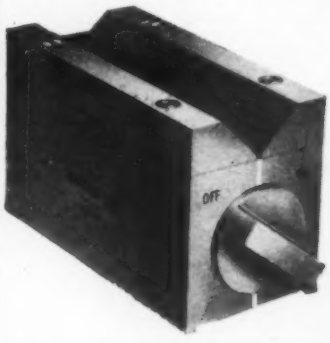

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Savings chart. Plan above shows how even modest weekly savings can grow into big figures. Moral: Join your Payroll Savings Plan next payday.

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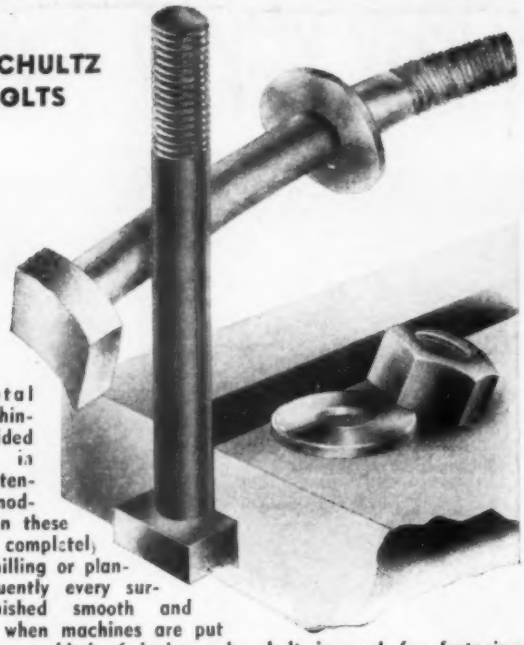

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Above is from a letter to Tool Engineer, January 1946.

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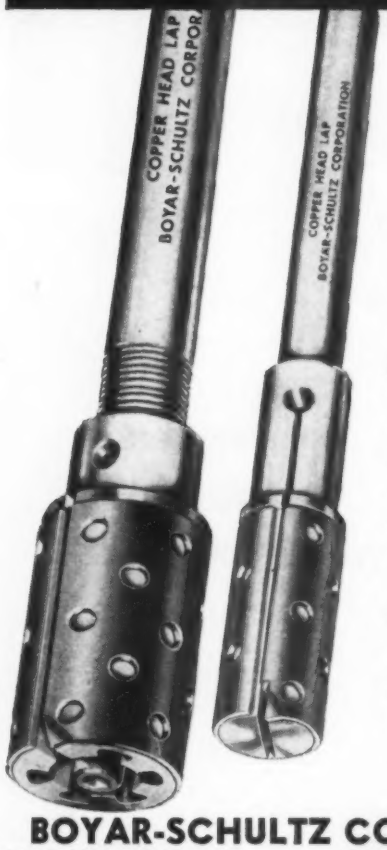

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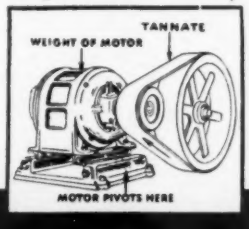

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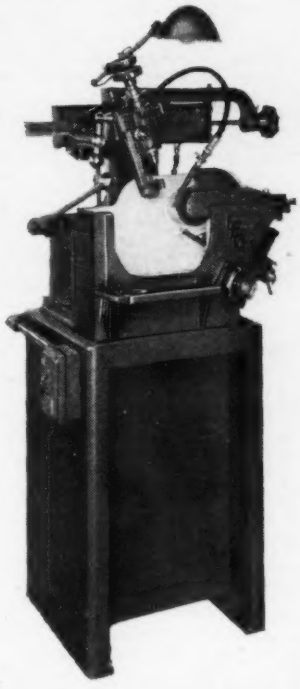

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POSSY'S TOOL & MFG. CO.
51 Meadowbrook Buffalo 6, N. Y.

HYDRAULIC HOBBING PRESSES

200-Ton Capacity for hobbing mold cavities. Embossing, etc, also fast delivery on presses to your specifications.

M. & N. Machine & Tool Wks.
146 Orano St. **Clifton, N. J.**

WORK WANTED

We represent a group of small companies, who have open facilities for ferris and non-ferris castings, press work, heat treating, plating, assembling, production machinery of all types, and tool room facilities for the manufacturing of tools, dies and fixtures—Quotations cheerfully given.

MARLOWE ENGINEERING CO.
P.O. Box 149, Charleston on the Kanawha, W. Va.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POSITIONS VACANT

WANTED: ASSISTANT Plant Manager, age 35 to 45, with Mechanical and Electrical Engineering background, to assist in the operation of a plant producing steel sheet and strip products. Applicants should give education and experience in detail, and state present and expected salary. Location Eastern Ohio. P-782, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FACTORY SUPERINTENDENT: for non-ferrous wire plant in New Jersey—300 employees, one experienced in handling men, mechanically trained and cost minded, under 50 years of age. Salary and bonus. Reply, giving full experience, replies treated in confidence. Experience in casting, rolling and drawing would be helpful. P-784, American Machinist, 330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

WANTED: ASSISTANT Shop Manager for a plant doing general repair work of heavy construction equipment and building new equipment; must be a competent machinist and familiar with modern welding techniques and shop practices. Age 35 to 45. Applicants hould give education and experience in detail, and state present and expected salary. Location near New York City. P-783, American Machinist, 330 W. 42nd St., New York 18, N. Y.

First Class Mechanic Wanted

To take charge of Metal Furniture Plant. Willing to go South. Must be thoroughly familiar with laying out dies. Write giving experience, salary, etc.

P-763, AMERICAN MACHINIST
330 WEST 42nd STREET, New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-six years' recognized standing and reputation carries on preliminary negotations for supervisory technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dunn Bldg., Buffalo 2, N. Y.

(Continued on opposite page)

Additional Position Vacant Ad on opposite page

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
(Not available for equipment advertising)
10 cents a word minimum charge $2.00.
(See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS. 50 cents a line an insertion.

INFORMATION
BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:
The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A. M. October 23rd will appear in the issue of November 7th subject to limitation of space available

WANTED

MECHANICAL ENGINEER

With extensive practical experience for a gear manufacturing plant; one whose experience has brought him into contact with cost reduction by means of designing of special tools and fixtures to step-up manufacturing procedures. Must be wide awake with past earnings approximating $10,000. State full particulars including educational background, names and addresses of former employers.

P-767, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

(Continued from opposite page)

POSITIONS WANTED

ENGINEERING EXECUTIVE: 45, now heading design and research for nationally known manufacturer of gear cutting machines and allied equipment, wishes to change to a position where engineering and production responsibility will be entirely under his control. Past record demonstrates skill and ability to meet exacting requirements in engineering and management. Salary $12,000. PW-770, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION MACHINE Shop foreman, age 45, is seeking employment with an established manufacturing firm. For the past twenty-five years I have had experience with automatic screw machines, turrets, drill pressers, mill machines, etc. During that time I have handled male and female help and studied methods, have made incentive system work, and have worked hand in hand with labor and management. Working at present as foreman. Would prefer to be established in a firm which is located in New York City or Brooklyn. Will also consider an out-of-town position. For further information in reference to my capability write to PW-785, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINIST AND Toolmaker, 25 years' experience on small, medium, and large precise work, desires connection with small progressive concern in supervisory capacity. PW-788, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EXECUTIVE POSITION wanted. Young man 32, with 11 years training and practical experience in sales engineering. Hardworking, capable, reliable, would like responsible position directing and coordinating work of personnel in engineering or sales. PW-791, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GENERAL MANAGER: With ability, experience, tact and initiative. Mechanical engineering and administrative training. Wide and practical experience and demonstrated ability in small and large volume manufacturing. Capacity to direct and get things done profitably. Can build up an organization and get the most out of it. Presently employed as General Manager in full charge. PW-792, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

REPRESENTATION OR Sales follow-up for out-of-town manufacturers of machinery, small tools and gages, parts, apparatus and equipment in New York City area solicited by an engineering firm capable of providing installation, engineering and specialized personnel necessary. All inquiries welcome. RA-747, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ESTABLISHED IMPORT & export firm located in Shanghai, China desires additional connection with leading manufacturers. References furnished. Address: Ray Snyder, c/o Dean Company, 26 O'Farrell Street, San Francisco 8, California.

SPECIALIZED FIRM in the line of measure, research and control instruments for Metal Working Industries as well as for precision machine tools, desires to enter in relation with important American firms to represent them on the Italian market. RA-787, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MANCHESTER EXPORTERS acting as Sole Agents for the Continent of Europe and Middle East for British Machine Tool Makers desire to extend their range by additional lines. Best references. Industrial Sales, Ltd., 60 King Street, Manchester 2, Lancs. England.

WESTERN EUROPE Mech, engr., exp. imps.-export mgmt., efficient & princ. language fluently, will reestabl. himself there in nr. future, full or part-time assign. on comm. basis consid. RA-794, American Machinist, 68 Post Street, San Francisco 4, California.

SPECIAL SERVICE

WANTED—Designing and drafting work. We specialize in Patent and Industrial drawings. Stull Designing & Drafting Company, 4705 Mahoning Ave., Youngstown, Ohio.

PATENT ATTORNEY

PATENTS—U. S. and Foreign Patents secured. Trade-marks and copyrights registered. Searches made to determine Patentability and Validity. Patent, Trade-mark and Unfair competition Causes. Lancaster, Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th St., N.W., Washington 5, D. C.

Manufacturers agents for precision tools and measuring instruments wanted by eastern manufacturer. Protected territories, lucrative commissions, sales samples and catalogues. State territory covered, size of organization, lines presently handled.
RW-795, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

MODELS
Plant layout models made to specifications.
Prototypes of any machine available in wood.
HOOSICK MODEL COMPANY
Petersburg New York

PETITT BROS. MACHINERY CO.
If You Want to Buy, Sell, or Trade
One Machine or Entire Plant
Consult Us Immediately
FRED PETITT — ALBERT PETITT
OFFICE AND WAREHOUSE
1240 WEST 4th ST. CHERRY 0609
CLEVELAND 13, OHIO

WANTED

To contact concerns that would be interested in taking over, on a royalty basis, the only practical milling and grinding attachment for lathes from nine inch swing up. My tool is powerful and accurate, speeds 265 to 1040. Handles end mills one eighth to one inch, drives one inch mill on half inch depth in 1045 SAE steel at the rate of three quarters inch per minute. Weighs 35 pounds, fitted to any lathe in an hour and installed in three minutes, spindle hole No. 9 B&S, spindle one and three eighths diameter, 11 inches long. Mounted on Timken roller bearings, inexpensive to build. I have wooden patterns for No. 2 size. This tool has no real competitors, patented in U. S. and Canada.

BO-789, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

AVAILABLE
Established Business

Because owner wishes to retire, we offer an established business which has for years sold Machine Tools, Foundry and Heat Treating equipment in Texas and Louisiana. Business as now operated has returned an excellent income and anyone who is now selling or who is familiar with the small tool or supply field could immediately expand along this line. Business now in own establishment, which could be sold or leased to new owner.

BO-790, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
20 T. or less 7/16" Rd. C R 1117, 1118, X-1314, X-1315.
AIRCRAFT METAL PRODUCTS
Grand Rapids 4 Mich. 73762

FOR SALE
IMMEDIATE DELIVERY
New and unused 350-ton high speed, single action, Elmes Hydraulic Press. Latest model. Complete specifications on request.
UNIVERSAL CASTINGS CORPORATION
5821 W. 66th Street, Chicago 38, Illinois

GRINDER
Sheffield Micro-form Grinder complete with circular grinding attachment. Used 2 to 3 months. Price $6,500.00.
FS-764, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Auction Advertising—see page 280

AUCTION

MACHINE TOOLS & EQUIPMENT
176 BUILDINGS & FACILITIES, ETC.
TO BE DISMANTLED AND REMOVED
8 AUTOMOBILE TRUCKS

THE PLANT OF

NATIONAL FIREWORKS, INC.

BRISTOL, VA.

To Be Sold in Separate Lots

TUESDAY & WEDNESDAY, OCTOBER 29 & 30, 1946

At 10 A. M. Each Day on the Premises

MOTOR DRIVEN TOOLS, Douglas Miller, Stockbridge 16" Shaper, Logan Screw Cutting Lathe, 10"x44'; LeBlond Quick Change Engine Lathe 14"x6', Bench Lathe, 14" Hack Saw, Excelsior Back Gear Vertical Ball Bearing Spindle Drill Press, 36 Walker-Turner 15" Drill Presses, 2 Buffalo 15" Bench Drill Presses, Bench Grinders, Portable Electric Saws, Drills, Hammers, etc., Arc Welder, 44 Greenerd Bench Arbor Presses, Small Tools, 30" Squaring Shears, 21 Stokes Tablet Machines, 14 Bliss Punch Presses, 6 Inclinable Punch Presses, 12 Logan Twin Ram Hydraulic Presses, 25 Wilson Mandrel Presses, Air Compressor with G.E. 100 H.P. Motor and Receiver, 16 Air Compressor Units, Power Baler, Magnetic Exciter, 5 Micro Pulverizers, 8 Multiple Weighing and Filling Machines, 3 Can Sealers, 20 Baird Tilting, Mixing and Tumbling Machines, 8 Markem Marking Machines, 3 Kewanee 150 H.P. Horizontal Tubular Boilers, Stokers, Feed Pumps, 4 De-Vilbiss Conveyor Paint Spray Units and Equipment, 4 Detroit Rex Products Co. Degreasers and Equipment, Transformers, Capacitors, Square "D" and Magnetic Switches, Starters, Controllers, 761 Electric Lamps, Floodlights, 150 Fire Extinguishers, assorted sizes; 48 Life Saving Blankets, Hose, etc., 50 4-Wheel Trucks with Pneumatic and Solid Tires, 6 Jiffy Lifters, 37 Truck Skids, Vulcan 8-ton Gas Driven Locomotive and 18 Cars; Large Quantity of Narrow Gauge Track, 1200 Ft. 12" Steel Ball Bearing Roller Conveyor, Motor Truck Snow Plow, 2 Auto Jacks, Capacity 4 Tons; Graco Chassis Lube, Vise, Garage Equipment, Shafting, Pulleys, Pipe Fittings, etc., Laboratory Equipment and Scales, Cafeteria Equipment, Office Furniture, Hospital Equipment.

8 CHEVROLET AUTOMOBILE TRUCKS

176 FRAME & METAL BUILDINGS TO BE DISMANTLED AND REMOVED. WIRE, TELEGRAPH POLES, TRANSFORMERS, ELECTRICAL EQUIPMENT, PIPE, ETC.

Write for Itemized Catalogue.

SAMUEL T. FREEMAN & CO., *Auctioneers*

1808-10 CHESTNUT STREET, PHILADELPHIA 3, PA.

27 WILLIAM STREET
NEW YORK 5, N. Y.

80 FEDERAL STREET
BOSTON 10, MASS.

MACHINE TOOL BARGAINS

GISHOLT No. 3 Turret Lathe
HEALD No. 72 and No. 70A Internal Grinder
HEALD No. 50 Cylinder Grinder
NORTHERN Heavy Duty 40" Precision Internal and External Grinders
NEWTON 4' Vertical Rotary Milling Machine
INGERSOLL 34"x48"x10' Double Housing Planer Type Milling Machine

All machinery in excellent condition and capable of holding new machine tolerances. May be inspected at our plant.

NORTHERN PUMP COMPANY
MINNEAPOLIS 13 MINNESOTA

NO. 16 GLEASON

HYPOID GEAR
GENERATOR
SERIAL NO. No. 16456
MOTOR DRIVEN
Jobbing Type
NEW 1942

J. L. LUCAS & SON, INC.
Bridgeport 5 Conn.

FOR SALE

AIR COMPRESSORS ER-1, 12x10 AC Motor Drive, 275 CF . (4)
MILLING MACHINE, K & T M-24 Simplex
MILLING MACHINE, 0-8 CINCINNATI, (rise and fall att.)
MILLING MACHINE, LeBlond #3 Plain
CHUCKERS, NEW BRITAIN GRIDLEY, 4 sp. No. 4-2, (3)
LO-SWING AUTOMATIC LATHES 14"x32" (8)
5"x22" (3)
SLAB MILLERS 36"x30"x14' Ingersoll
CLEVELAND HOBBING MACHINE CO. 8 sp. RIGIDTURNER
ENGINE LATHE 32"x14' ALLIANCE, QCG, GEARED HEAD
TAPPING MACHINE, LANDMACO single head.

CONTINENTAL SALVAGE & MACHINERY CORP.
1836 Euclid Ave. Cleveland 15, O.

THREAD GAGES—PLUG AND RING

Slightly used. NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
LESS 75 Percent Discount.

ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
LESS 75 Percent Discount.

DE WITT TOOL COMPANY
173 GRAND STREET NEW YORK 13, N. Y.

Send For Our Bargain Circular

Univ. Cyl. Grinders. Landis Type L.C. 12x36". Landis Type C. 10"x24" B and S No. I 10"x24". Norton 18" Double Floor. Models 5 HP. AC.
Turret Lathes: Gisholt 3½" Cap. Quick Return. J and L 3" Cap. 3x36. Saddle Type.
Engine Lathes. Monarch 6x16", Geared Head. AC 3 HP. Motor. Draw Bar, 29 Collets. Push Button Control. New Cross Travel Screw, and Clutch Adjuster, Good Condition.
Higley 21" Undercut Cold Saw No. 9 Complete. Sellers drill Grinder. Cap 2½". Several Drill Presses to 3" Cap.
New Britain Automatic. 6 Spindle. 1⅝ Cap. Complete, many tools. Box and Cutting Tools. Good Condition.

JAY SALTER
306 Rosedale St. Rochester, N. Y.

NEW—USED **MACHINERY** and EQUIPMENT
LARGE STOCK ON HAND
Hasco MACHINERY COMPANY
661-671 FRELINGHUYSEN AVE.
NEWARK 5, N. J. BIGELOW 3-3486-78

Lathe, Screw Cutting 48"x18' Cts. Fitchburg
Slotter 18" Betts, H.D. Cir. table feed, Ideal for roughing out shapes.
Production Miller Beeman & Smith 36"x36"x84" All Mach's are step pulley drive & reasonably priced.

STEWART S. KICHLINE
2042 Hanover Ave. Allentown, Pa.

FOR SALE

24" Gisholt Turret Lathe, Serial 23-377, Belt Driven, with three (3) Boring Bars. Machine in fair condition.

Birdsboro Steel Foundry and Machine Company
Birdsboro, Pennsylvania

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

1—#00 Brown & Sharpe Full Automatic, Standard Speed
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1⅝" 4-spindle Automatics, complete
2—3¾" Cleveland Model A.
1—#1 Brown & Sharpe Standard Speed, Belt Drive, Full Automatic (same size as #2).
1—#2G Brown & Sharpe Full Automatic, serial #5396.

LATHES

Logan Q.C.G. Lathes (new).
Sebastian Engine Lathes (new).
14" x 20' Hendey Toolmakers Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' Lodge & Shipley 12-speed Grd. Hd.
18" x 10' American, Geared Head, Taper.
20" x 10' Hendey with Taper.
24" x 20' American, Motor drive.
48" x 30' Simmons Geared Head, 1941.
18" x 6' Chard, M.D.
14" x 6' Rockford Cone drive (two)
13" x 6' Williard, geared head
18" x 222" Hendey, M.D. (two)
20" x 11' Schumacher-Boye, M.D.
14" x 6' Hendey Yoke Head
28" x 10' Davis cone driven

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal.
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.
#4 Foster GFH Hand Turret Lathe.
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)

TURRET PUNCHES

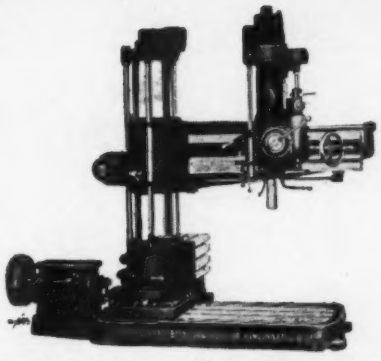
Hecker, vertical type, 8-station, air operated, 18" throat.

PLANERS

20" x 20" x 24" N.-B.-P., Planer Shaper.
26" x 26" x 8' Gray Planer, 2 heads.

SHEARS & METAL WORKING

Lennox Splitting Shear ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.



Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 48" Roller Leveller, 6 Rolls.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Thread Miller, Hall Planetary #1—24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#3B Hendey Universal Miller, motor drive.
Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.
#4 Cincinnati Vertical High Power Miller. (2)

#16 Blanchard Surface Grinder, 30" dia., magnetic chuck, 25 h.p. motor on spindle.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter.

RADIAL DRILLS

4' Arm, 11" Column Cincinnati-Bickford.
5' Arm, 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.
6' Arm, 15" Column Cincinnati-Bickford.
3½', 10" Col., Cincinnati-Bickford AC Motor Drive, Gear Box.

GRINDERS

Queen City Dble. End Grinders, motor driven (new).
#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole; 4" deep.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.
2—Cincinnati, #1½ Tool & Cutter Grinders.

BORING MILLS

100" Niles-Bement-Pond, 2-head geared motor drive.
72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

Famco Arbor & Foot Presses (new).
#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed. 24" x 36", 4-post.
75 ton H.P.M. 2 post, Hydraulic Press.
Hilles & Jones #5 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 54" throat.

SHAPERS & GEAR CUTTERS

1—24" Gould & Eberhardt Backgeared Crank Shaper, M.D.
#1 Adams Gear Hobbers, Belt driven (3).
24" American Direct Motor Drive.
15" Potter & Johnson, Universal Knee.
Slotter 12" stroke New Haven, motor drive.
Rhodes 7" stroke, Shaper.

MISCELLANEOUS

15 KVA Ace Spot Welder, 18" throat, 1/60/440 volt
Thomson Cutter and Creaser, 12½x18½.
Heat Treating Furnaces for the tool room.

120" x 96" x 24' Simmons Heavy Duty Double Housing Planer. Complete with 4 heads and standard equipment, arranged for reversing motor drive and rapid traverse and including one Reliance 50 HP, 150/900 RPM D.C. motor, frame P-4617, 230 volts serial #644739, one Cutler Hammer control Box #B-871007A7.

Approved Dealer War Assets N. Y. 47

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Telephone
MAIN 6347-6348

FALK MACHINERY COMPANY

Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

MOREY DEPENDABLE

AVAILABLE for PROMPT SHIPMENT

AUTOMATIC SCREW MACHINES

BILLINGS & SPENCER No. B2 Dimatic Automatic, latest type
CLEVELAND ⅞" to 2½" Model A
CONOMATIC 3½" 4 spindle—latest type
NATIONAL ACME 9/16" model "C, 5 spindle, M.D.
NEW BRITAIN-GRIDLEY #65, 6 spdle; chucking; latest type

BORING MILLS—Horizontal

FRANKLIN 4½" bar, single pulley drive
GIDDINGS & LEWIS #25 2½" bar, M.D.
LUCAS #31—3" bar—motor drive
NILES BEMENT POND 5½" bar—M.D.
NILES BEMENT POND 4½" bar—floor type—M.D.
NILES BEMENT POND 5" bar—floor type—M.D.
NILES BEMENT POND 6" bar—floor type—M.D.
NILES BEMENT POND 7" bar—floor type—M.D.
OHIO #5F-420 5" bar Floor type, latest type
P & H #10—3½" bar—floor type—M.D.
PETRICK 3½" bar, floor type, M.D.

BORING MILLS—Vertical

BETTS 120"—2 swivel heads, motor drive
BULLARD 24", 36", 42" New Era Type M.D.
BULLARD 86"—2 swivel heads—motor drive
COLBURN 72' 2 swivel heads, AC, M.D.
KING 30" Vert., M.D.
KING 72" 3 heads, AC, M.D., Latest type
KING 62" 2 swivel heads, PRT, AC, M.D.
NILES 42"—2 swivel heads; power rapid traverse
NILES 73"; 2 swivel heads; AC; M.D.
NILES BEMENT POND—100" two swivel heads, PRT Motor Drive

DRILLS

ALLEN #2, 2-4 spindles, latest type
BAKER #121 Single spindle—latest type
BAUSH #2, #3, Multiple spindle, M.D.
BODINE No. 42 20 Auto.
COLBURN #14, 2 spindle, heavy duty, AC, M.D.
EDLUND No. 1B, single spindle, M.D.
EDLUND No. 2MS, 2 spindle, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
NATCO C-13H multiple spindle
PRATT & WHITNEY No. ½Bx50" 2 spdle. Deep Hole—latest type

DRILLS—RADIAL

AMERICAN 3'11", 5'11", latest type
AMERICAN 4'11", 5'11", 5'13" triple geared, AC, M.D.
AMERICAN 5'13" Uni. triple geared, AC, M.D.
BICKFORD 4'11", 5'11", 5'13", AC., M.D.
CANEDY OTTO 3'11" New
CARLTON 5'14", 7'15"; M.D.
CARLTON 3'11", 6'17", 7'19", latest type
CINCINNATI BICKFORD 4'11", 6'15", latest type, M.D.
CINCINNATI BICKFORD 6'19", Super Service, M.D., latest type
DRESES 4'13", 5'15", AC, M.D.
FOSDICK 5'14" AC, M.D.
MORRIS 4'11", AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
REED PRENTICE 4', 6', AC, M.D.
RYERSON 4'11" AC, M.D.
WESTERN 3' single pulley drive
WESTERN 4'18"; 5'18"; 6'20"—latest type

Nearly All Built After 1941

GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 3 Gear Hobber
BARBER COLMAN #12 hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
BROWN & SHARPE No. 13 Gear Cutter
BROWN & SHARPE No. 6 x 60 Gear Cutter
BROWN & SHARPE No. 44 Gear Hobber
CINCINNATI Gear Burnisher
FELLOWS #7, #7A, 72, 77 gear shaper
FELLOWS #624A Gear Shaper, Latest Type
FELLOWS #71A Gear Shaper, latest type
GLEASON #13 tester, M.D.
GLEASON 24" Bevel Gear Planer
GLEASON 18" bevel gear generator
GLEASON bevel gear tester and lapper, M.D.
G & E #36B Gear Cutter; Spur & Bevel, M.D.
G & E #96H Gear Hobber, with differential
MICHIGAN #854 Gear Finisher—latest type

GRINDERS—Cylindrical—Plain and Universal

BROWN & SHARPE #1, #3, #4, Uni., M.D. latest type
BROWN & SHARPE #3 univ., M.D.
BROWN & SHARPE No. 5 Plain, M.D.—latest
CINCINNATI 12"x30" Univ., HYD., latest type
CINCINNATI 12x48 Universal Hyd., latest type
LANDIS 6x20 Plain—motor drive
LANDIS 6x18 plain, M.D.
LANDIS 12x36 Universal Type LC Hydraulic; latest type
LANDIS 12x64 Universal—motor drive
NORTON 10x18 plain, M.D.
NORTON 10"x36 Type C Plain HYD., latest type
NORTON 14x48 Univ. Type C Multi-purpose HYD., latest type

GRINDERS—Internal, Cutter and MISCELLANEOUS

BRIDGEPORT 18x110 face and knife
BROWN & SHARPE #13, Uni., and tool, M.D.
BRYANT #6 internal, M.D.
BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5 internal, hyd., latest type
CINCINNATI #2 Plain Tool & Cutter—latest
FITCHBURG Uni. spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD No. 70—Internal—motor drive
HEALD 72A3 Sizematic Internal, latest type
HEALD No. 81—Plain Internal—latest type
HEALD 72A5 Plain internal dial type, latest type
LEBLOND #2 uni., tool and cutter, latest type
OLIVER Univ. and Tool—latest type
OLIVER #510 drill, latest type
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #1 tool cutter
SELLERS #2 uni., tool cutter
SELLERS #4T Univ. tool—latest type

GRINDERS—Surface

ABRASIVE 1½, latest type
ABRASIVE #3 22x8x12, M.D.
ARTER, 8" Rotary Surface
ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #16—26" Chuck—motor drive
BLANCHARD No. 18—30" Chuck—latest type
MATTISON 16x24x96—Hydraulic—latest type
MATTISON 20x24x72—Hydraulic—latest type
NORTON 10x60—Hydraulic—latest type

LATHES—Engine & Mfg.

AMERICAN 36"x25' centers, Timken Bearing, 2 carriages, taper attachment, latest type
AXELSON 24"x72" centers—Timken Bearing—latest type
BRIDGEFORD 36"x28'; 36"x32'; 36"x35', bed—2 carriages
BRIDGEFORD 42"x35' Bed—2 Carriages—M.D.
HARDINGE #TR 59, latest type
HENDEY—12x54 centers—Mfg.—latest type
HENDEY 20"x8' bed. Yoke head. M.D. Tapgr Attach.
LEBLOND 13"x4' bed—Timken Bearing—Rapid Production—latest type
LEBLOND 17"x14" bed, rapid production, Timken bearing,—latest type
LEBLOND 20"x48',centers—Timken Bearing, latest type, rapid production
LOSWING 4x34, 4x60, 8x34, 8x108, 8x60—Timken Bearing—latest type
LOSWING 10x34 Model LR Automatic, Timken Bearing, latest type
NILES 36"x24' centers, "Time Saver", Timken Bearing, 2 carriages, taper attachment, PRT, latest type
NILES 36"x25 centers, 2 carriages; PRT; Timken Bearing, latest type
NILES 48x55' centers, Timken Bearing, 2 carriages, taper attac., P.R.T., latest type
NILES 60"x10' centers, 60"x15' centers, 60"x35' centers, 60"x"40" centers, Timken Bearing, 1 or 2 carriages, taper attachment, PRT, latest type
PITTSBURGH 50'x30' bed—M.D.
RIVETT Style 918 Bench Type—ball bearing

LATHES—Turret

BARDONS & OLIVER #3 latest type
BARDONS & OLIVER No. 5, No. 7 Univ., Timken Bearing, chucking; latest type
BROWN & SHARPE #1 Hand screw machine, Timken bearing—latest type
CINCINNATI ACME #5W—Timken Bearing—latest type—2" Bar Cap.

MOREY MACHINERY C

USED MACHINE TOOLS

CINCINNATI ACME #1 Universal—Timken Bearing—latest type
GISHOLT #3, #4 Univ. Timken Bearing—latest
GISHOLT #3D Simplimatics—Timken Bearing—latest type
GISHOLT #4L, 9" hole—cross sliding Turret—Timken Bearing—latest type
GISHOLT #1L, #2L, uni. Timken bearing, latest type
JONES & LAMSON #3, #5, #7C Univ.; latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
MOREY #2G, 1" cap.—Timken Bearing
MOREY #3 Univ. 1½" Cap.—Timken Bearing
MOREY #4 Univ.; 2 cap., Timken Bearing
WARNER & SWASEY #3, #4, Univ., Timken Bearing—latest type
WARNER & SWASEY No. 1A Universal, Timken Bearing, M.D.
WARNER & SWASEY #3A Universal—M.D.
WARNER & SWASEY #4A Uni. Timken bearing, latest type

MILLING MACHINES—Manufacturing

BRIGGS Type 2A Production, Hydraulic, latest type
BROWN & SHARPE #12 automatic, Timken Bearing, latest type
CINCINNATI 4-36 Hydro. Timken Bearing—latest
CINCINNATI #0-3 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI #1-12, #1-18 Plain Auto.—Timken Bearing, latest type
CINCINNATI 48" duplex, automatic, SPD
INGERSOLL 24x24x8' Planer Type—1 head
INGERSOLL 42x36x16' Planer Type—4 heads
KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
KENT OWENS #1 Hand
MOREY #12M 2 spdle Profiler & Milling Machine
NICHOLS hand, M.D.—latest type
OHIO Auto. 16"x72" table—Timken Bearing—latest type—36" longitudinal feed
SUNSTRAND #33 Duplex Timken Bearing—latest type
SUNSTRAND #25 Duplex Timken Bearing—latest type

MILLING MACHINES—Plain

BROWN & SHARPE #2—Light Type—latest type
BROWN & SHARPE #2B, #3B, #4B—standard type—Timken Bearing—latest type
BROWN & SHARPE #000 Timken Bearing, latest type
BROWN & SHARPE No. 2Y, M.D.
CINCINNATI #2 Timken Bearing, dial type, latest type
CINCINNATI #5 high powered, M.D.
KEARNEY & TRECKER #2H, #2HL—Timken Bearing—latest type
KEARNEY & TRECKER #3K, Timken Bearing, latest type
KEMPSMITH #4 Maximiller—Timken Bearing—latest type

MILLING MACHINES—Universal

AMES Bench, Timken Bearing, latest type, M.D. 1" collet.
BROWN & SHARPE #3A Timken Bearing—dual control—latest type
ROCKFORD #2B—motorized

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2, #4—Dial Type—Timken Bearing—latest type
COCHRANE BLY Universal Vertical Shaper-Miller; motor drive
KEARNEY & TRECKER #2H, #3K, Timken Bearing, latest type
REED PRENTICE #3VG—high speed—latest type

PLANERS

BELMAR 36x36x10' 2 heads, AC, M.D.
BELMAR 48x48x12' 3 heads, AC, M.D.
BICKETT 36x36x12' 3 heads, AC, M.D.
CHANDLER 36x36x20', 4 heads, AC, M.D.
CINCINNATI 24" Crank—motor drive
CINCINNATI 36x36x5' Box Table, PRT, 1 head—motor drive
CINCINNATI 48x48x20', 3 heads, AC, M.D.
CINCINNATI 84x72x16', HYPRO, 4 heads, varivoltage drive, latest type
CINCINNATI 120x96x20'—4 heads, box table—PRT—motor drive
CINCINNATI 36x36x8', 2 heads, AC, M.D.
CINCINNATI 42x36x12', 2 heads, AC, M.D.
CINCINNATI 60x48x14' 4 heads, AC, M.D.
CLEVELAND 48x48x16' Opensides 3 heads, M.D.
DETRICK & HARVEY 48x48x10', 12' open side, 3 heads, M.D.
DETRICK & HARVEY 48x48x16' 4 heads, Hydraulic, M.D.
GRAY 36x36x8', 10' 2 heads, AC, M.D.
GRAY 44x36x12', 4 heads, AC, M.D.
GRAY 48x48x14', 4 heads, AC, M.D.
GRAY 54x42x10', 2 heads, AC, M.D.
GRAY 60x48x16', 3 heads, AC, M.D.
HAMILTON 42x42x20', 4 heads, motor drive
HAMILTON 48x48x16', 4 heads, DC, M.D.
LIBERTY 36x36x9', 3 heads, AC, M.D.
LYND FARQUHAR 26" Openside, motor drive
NBP 36x36x10', 3 heads, DC, M.D.
NBP 42x42x12', 2 heads, AC, M.D.
NBP 48x48x14', 16', 2-4 heads, AC, M.D.
NBP 54x54x12', 2 heads, box table, AC, M.D.
NILES 48x48x12' Time Saver, 3 heads, power rapid traverse, box table, DC, M.D., latest type
NILES BEMENT POND 96x80x20' box table 4 heads Hyd. PRT—motor drive
OHIO 36x36x10', 2 heads, AC, M.D.
OHIO 42x42x12', 2 heads, AC, M.D.
PATCH 48x48x14', 4 heads, DC, M.D.
POND 42x42x12', 2 heads, AC, M.D.
POND 48x48x16', 2 heads, AC, M.D.
PUTNAM 48x48x18', 4 heads, AC, M.D.
WOODWARD & POWELL 36x36x12', 4 heads, AC, M.D.
WOODWARD & POWELL 42x42x10', 4 heads, AC, M.D.
WOODWARD & POWELL 84x48x18', 2 heads, AC, M.D.

PRESSES

BLISS #6 Arbor Press
FERRACUTE No. DG-55 Drawing—latest type
GREENARD #6 Arbor Press
WATSON STILLMAN Hyd. Stght. Press—20 ton

SAWS

BRIDGEPORT #48W Abrasive
CAMPBELL No. 213 Wet Abrasive Cutoff, latest type
CAMPBELL #401 Cutamatic Wet Abrasive—latest
GROB #OS-20 band, latest type
LUCAS #138 cold saw, motor driven
MAQUOKETA 10x10 hack, M.D.
MARVEL #9, 10x10 Hack; latest type
MOTCH & MERRYWEATHER #3 Cold Saw—Hyd.—latest type
PEERLESS 14x14 Hack; latest type

SHAPERS

BETTS 18" vert, slotter, DC, M.D.
CINCINNATI 28" horiz. double head
COCHRANE BLY Universal Vertical Shaper-Miller; motor drive
JONES 6" Vertical—latest type
LAMAIRE 18" Vert. Hydraulic—latest type
MOREY 10", 14" Vertical—latest type
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
PRATT & WHITNEY 6", 10" Vertical, Motor drive
PRATT & WHITNEY 6", 12" Model B, latest type

THREAD MILLING MACHINES

MOREY SHIELDS 12x30, 12x60, 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, 6x60, 6x20, Model C—latest type
PRATT & WHITNEY 6x120, 6x132—motor drive
SMALLEY General #20, M.D.

MISCELLANEOUS

BARNES #2 SS Hone—latest type
BAUSH radial tapper ⅜"
BILLINGS & SPENCER 200, 400, 800 lbs. broad drop hammer
BRINELL Auto. Direct Reading Hardness Testing Machine
CLEVELAND Hob Relieving Machine
COLONIAL Model HAS-25-72 Universal, Broach, horizontal, hyd., 25 ton cap.
DELAVAL Oil Clarifier
LEBLOND #2 Horiz. Hone—SS
LEBLOND #2 Deep Hole Borer; latest type
MAGNAFLUX unit #AN-724, latest type
MORTON 60" Combination Traveling head Planer, Milling & Drilling
NBP 7'x14" 6 rolls leveling and straightening
NILES 30"x50' Deep Hole Borer, Timken Bearing, latest type
PRATT & WHITNEY #3B Jig Borer
RHENBERG JACOBSEN Centering Machine
RICKET SCHAEFER #58-C, horiz. taper
SNYDER #10-V-18 Hyd. Horiz. Driller
TREADWELL 12" Pipe Threader
WHITON 8x108 Duplex Centering, M.D.
YODER Mult. Tube Cutting Machine

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Cut Your Production Costs With Botwinik's Efficient, Low Cost Used Machine Tools

★ SURFACE GRINDERS

7—B. & S. No. 2B Surf. Grind. Machines, M.D., latest type, permanent mag. chucks, capac, lgth. 18", width 6", hght. 9½", mtzd. spins. with Roto-Clone Dust Collectors.

4—Norton 6"x18" Horz. Surf. Grinders, M.D., capac. 10¼", permanent mag. chucks, with coolant.

3—Norton Vert. 6"x18" Surf. Grinders, M.D., capac. 10¼", vert. move. wheel head 12", excello BB spin., 3450 RPM.

2—Norton No. 2 Univ. Tool & Cutter Grinders, Hyd., M.D., latest type, with full asstmt. of equip., sw. on cens. 12", capac.: Long. tble. move. 24", cross feed 8", tble. speeds 7-360 per min.

★ PLANERS

1—Putnam 84"x84"x40' dbl. hous. Planer, revers, M.D., and controls, 2 heds on cross rail, 2 side heds.
1—Cin. 48"x48"x22', M.D., 4 heds.

1—Wood & Pow. 36"x36"x12', M.D., 2 heds.

1—Am. Foundry and Machine Co. 30"x30"x10', 1 cross hed, 1 side hed, Openside Planer, M.D.

★ TURRET LATHES

2—W. & S., Univ. Hollow Hex. Turret Lathes, Model 1A, M.D., bar capac.: sw. over bed 16¾", sw. over cr. slide 13½", hole thru spin. 2½", Timken Bear., covered ways, arr. for bar, turn. lgth. 35".
1—W. & S. Univ. Hollow Hex. Turret Lathe, Model 2A, M.D., bar capac.: sw. over bed 20½", sw. over cr. slide 16", hole thru spin. 3⅞", Timk. Bear., 12 speed, covered ways, arr. for chuck. turn. lgth. 39".
1—Gisholt Model 1L Saddle Type Turret Lathe, M.D., AC elec. equip., Timk. Bear. spin., hrdnd. steel ways, cross slid. turret, bar capac. 2½", sw. over bed 17", max. lgth. turned 36", arr. for bar.

★ MILLERS

1—B. & S. No. 3A Stand. Miller, dbl. overarm, motor in base, tbl. wkg. surf. 45½"x11½", range: long. 28", cross 10", vert. 18".

1—Van Norman No. 2 Pl. Mill. Machine M.D., very latest type, tbl. wkg. surf. 12"x50", range: long. 28", cross 12", vert. 16".

1—Cin. No. 3 Hi Power Pl. Miller, M.D., slotted nose, spin. type, tbl. wkg. surf. 55¾"x13½", range power feeds: long. 34", cross 12", vert. 20", AC motor and controls, overarm sup., coolant, power feeds in all directions, rap. trav., stand. taper.

2—B. & S. No. 000 Pl. Mill. Machines, M.D., late type, tbl. wkg. surf. 25¾"x7⅞", range: long 6", cr. adj. of spin. 2", vert. adj. of hed 5½".

1—B. & S. No. 3B Stand. Pl. Miller, dbl. overarm, motor in base, No. 50 Nat'l. Taper, tbl. wkg. surf. 60¼"x14", capac. 34"x12"x19½", spin. speeds 30-1200 RPM, latest type.

★ LATHES

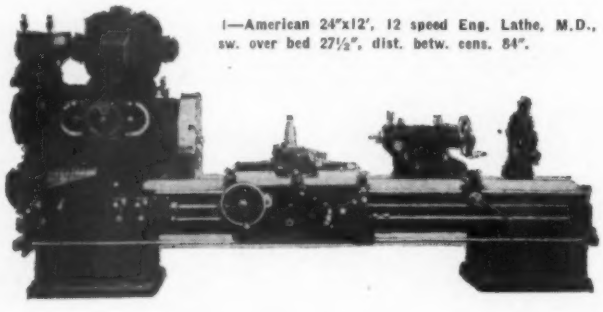
1—LeBlond 23"x12' Heavy Duty Eng. Lathe, M.D., 12 speeds, grd. head, sw. over bed 24½", dist. betw. cens. 84".

1—Bridgeford 36"x56', 15 speed, grd. hed, Eng. Lathe, M.D., AC elec. equip., power rap. trav. to carr., compd. rest, 2 steady rests, sw. over bed 38", dist. betw. cens. 48'.

1—P. & W. 20"x48" cens., Med. B, 16 speed, grd. hed, motor in base, Eng. Lathe, sw. over bed 21¼".

★ CYLINDRICAL GRINDERS

3—B. & S. No. 1 Univ. Grinder M.D., latest type, mtzd., capac. 10"x20".



1—American 24"x12', 12 speed Eng. Lathe, M.D., sw. over bed 27½", dist. betw. cens. 84".

The Botwinik nameplate is a mark of quality—a guarantee of satisfaction to hundreds of industries who are using our machines.

BOTWINIK BROTHERS OF MASS., INC.
3 SHERMAN STREET WORCESTER (1) MASS.

LOOK THROUGH THIS LIST

BORING MACHINES

100" NBP Heavy Pattern mill (2)
96" Cincinnati "Massive Pattern" mill
60" Colburn mill
53" Niles Bement Pond mill
2¾" bar Lucas horizontal
5" bar Barrett cylinder borer
No. 112C Excello diamond borer
Munson double end borer
6 spdl. No. 10D Moline cylinder borer

RADIAL DRILLS

3', 9" Col. Cinc. Bick. Super Service
3' Western, Timken Bearing
3' Carlton sensitive
4' Hammond sensitive
4', 13" col. Carlton
5' Western

GRINDERS

No. 33 Excello thread grinder
No. 2 Cincinnati centerless
Nos. 72, 72A3, 75A Heald internal
6" x 18" Grand Rapids hydr. surface
Nos. 10 & 18 Blanchard surface
8" x 24", No. 78 Wil. & Morgan surf.
No. 2 Brown & Sharpe universal
3" x 12" No. 5 Brown & Sharpe
6"x18" Norton hydr. cylindrical
8"x18", No. 10 B. & S. elec. hydraulic
6"x18" Landis type hydraulic
7" x 11" Leach
10"x18" & 10"x50" Norton plain
10"x24", 18"x36" & 18"x72" Landis plain
1¾" to 5" Sellers drill grinder
No. 30 Willeys carbide tool

ENGINE LATHES

12" x 24" ctrs. Sebastian grd. hd.
14" x 6' Lebond late type
14"x6' Hendey grd. hd.
14" x 6' & 16" x 6' American grd. hd.
14" x 6' & 18" x 8' American cone
14" x 6' Mulliner
18" x 8' Springfield grd. hd.
36" x 16' Bridgeford geared head

MILLERS

Nos. 2B & 3B Kearney & Trecker plain
No. 3S Cincinnati plain
No. 3B Brown & Sharpe plain
No. 3B Kearney & Trecker vertical
No. 3 Reed Prentice vertical
No. 4 Cincinnati vertical
Nos. 4-36 & 4-48 Cincinnati Hydromatic
30"x48" Newton Rotary
30", 42" & 84" Ingersoll Rotary
Ingersoll planer type, various sizes
Type C Hall planetary thread
No. 4 Lees Bradner univ. thread
12" Cincinnati plain Mfg.
No. 32 Kempsmith Mfg.
4" Rice Barton double spline
Pratt & Whitney double spline
No. 1 Davis & Thompson drum duplex
Ingersoll drum type duplex

PLANERS

33"x33"x8' Cincinnati, 3 heads
30"x30"x12' Cleveland openside, 2 heads

SHAPERS

15" Potter & Johnston universal
16" Gould & Eberhardt (old style)
16" & 20" Gemco (New)
32" Morton draw cut

MISCELLANEOUS

Brake, No. 35 D. & K., box & pan
Buffer, No. 5 Mitchell electric
Hammer, 3000-lb. B. & S. bd. drop
Honer, No. H-1 Micromatic Hydrohoner
Honer, No. 211 Barnes vertical
Lapper, No. 10 U Norton
Pipe machine, 6" Bignall & Keeler
Press, No. 10 Bliss reducing
Riveter, No. 5½B High Speed
Sand Cutter, Cleveland Model F
Saw, No. 401 Campbell Cutamatic
Slotter, 16" Bement Miles
Welder, 90 KVA Fisher Body seam

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICH.

NEW

Abrasive No. 1½ Surface Grinders, M.D.

Racine 6x6" Hacksaws, M.D.

Famco No. 6-C Arbor Presses

Pexto No. 280 Circular Shears

AARON MACHINERY CO., INC.
45 CROSBY STREET NEW YORK, N. Y.

NO. 17 GLEASON

HYPOID
GEAR TESTING
MACHINE
MOTOR DRIVEN
Manual Type
NEW 1942

J. L. LUCAS & SON, INC.
Bridgeport 5 Conn.

At our prices you can AFFORD a MILWAUKEE SIMPLEX MILL

No. 1402, No. 1404
Illustrated No. 1836

MILWAUKEE BED TYPE MILLING MACHINES
(slightly used)

Powerful, production type, high speeds, rapid feeds, ruggedly built to take it and turn out fine finish work.

Lots of extras too! Complete with all electrical equipment—nothing more to buy. Priced to show you a profit on your milling operations.

Use these mills on jobs like these:

Automatic, aircraft or precise railroad parts, pumps, bodies, shafts, housings, transmissions, cranks, hangers, exhaust manifold facing, spring pads, oil pans, clutch cover plates, foot pads, brackets, keyways.

SPECIFICATIONS

Model No.	1402	1404	1836
Table—Power feed	24"	48"	36"
Working surface	14" x 74"	14" x 98"	18" x 54"
P.R. Traverse rate	240"/min.	240"/min.	240"/min.

EMERMAN MACHINERY CORP.
875 W. 120TH STREET CHICAGO 43, ILLINOIS

QUALITY *Machine Tools*
NOW IN STOCK

No. 2H Kearney & Trecker Milwaukee Plain Milling Machine, double overarm, Timken spindle, No. 50 National taper, motor in base. New in 1943.

No. 36 Van Norman Plain Milling Machine, swivel head type, with No. 50 National Taper in spindle, Timken bearings, motor driven. New in 1942.

AUTOMATICS
1⅝" Cone, eight spindle. New 1942.
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.
No. 00, 0, 2G Brown & Sharpe.

DRILLS
4 Ft. Carlton Radial Drill, enc. head.
★ **6 ft. American Radial, enclosed head.**
No. D2 Colburn, single spindle.
42" Cincinnati Bickford.
Allen Sensitive Drill, four spindle.
★ **No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20" x 40".**
Pratt & Whitney Gun Barrel Drill.
LeBlond Gun Barrel Drill.

GEAR CUTTERS
No. 12 Barber Colman Gear Hobber.
No. 6, 61 Fellows Gear Shaper, m.d.
No. 5AC Lees Bradner Gear Hobber.
6" Gleason Str. Bevel Gear Generator.

GRINDERS
36" x 168" Mattison Surface Grinder.
No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Int. Grinder.
No. 72A3 Heald Gagematic Int. Grinder.
No. 70 and 75 Heald Internal Grinders.
10"x24" Norton Cylindrical Grinder.
10" x 72" Norton Cylindrical Grinder.
8"x24" Thompson Surface Grinder.
No. 2 Cincinnati Centerless Grinder.
★ **No. 3 Cincinnati Centerless Grinder.**
No. 3 Cincinnati Universal Grinder.

LATHES, ENGINE
★ **12"x30" Monarch Model C Tool Room.**
14" x 6' Sebastian, motor in base.
16"x6' Hendey, g.h.
48" x 12' Lodge & Shipley, C.D.
No. 12 Gisholt Hyd. Lathe.
LR Lo-Swing Lathe, m.d., new in 1940.
15" x 30" Lipe Carbo-matic, new in 1943.

LATHES, TURRET
No. 3A Warner & Swasey, g.h.
No. 2A Warner & Swasey, Timken Bearing, new 1942.
No. 1A Warner & Swasey, g.h., new 1943.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

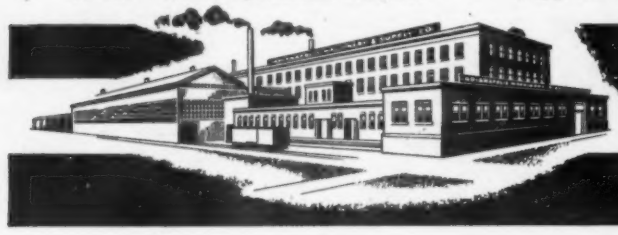
MILLS
No. 4A Brown & Sharpe Universal, s.p.d.
No. 3 Cincinnati Universal, s.p.d.
No. 4 Cin. Plain, Rect. Overarm.
No. 2-MH Cincinnati Plain, m.d.
★ **No. 4H Milwaukee, Double Overarm, motor in base, new 1940.**
No. 2H Milwaukee Vert., motor in base.
No. 0-8 Cincinnati Plain Automatic, m.d.
★ **18" Cin. Plain Mfg., m.d., new 1943.**
No. 2209 Milwaukee, Table 22" x 158".
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.
4" Pratt & Whitney Spline Mill.

MISCELLANEOUS
No. 17 Greenerd Arbor Press.
2500 Ton Lake Erie Forming Press.
Reliance Sand Blast No. 193A.
No. 100 Micromatic Hydrohoner.
Schraner Crankshaft Lap. Mach., Mod. B.
8" x 7" Troy Vertical Steam Engine.
Gray Nibbler, ⅜" capacity.

PLANERS AND SHAPERS
16" Gould & Eberhardt, s.p.d.
★ **6" Pratt & Whitney Vertical Shaper.**
38" x 38" x 14' Ohio Planer.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. motor drive.

SAWS
9" x 9" Peerless, Hydraulic.

(Approved Dealer for War Assets Administration Surplus Machines)



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OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, 9/16" x ⅝" Model G
AUTOMATICS, Cone, 1⅛", 2⅝" 4 spdle.
AUTOMATICS, Gridley, 1¼", 2¼", & 2⅝ Model F, M.D.
AUTOMATICS, Gridley, 2¼", 3¼", & 5¼" M.D.
AUTOMATICS, Cleveland 1¼", 1½", 2, 2½, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland ⅞, 1¼, & 2" Mod. B
#11 Polymatic Form & Cutoff
#1 Wickman Swiss Type, used very little
CLEVELAND, 3½" Model K-4 M.D.
AUTOMATICS, Potter & Johnston #5a & #6a, M.D.
CONOMATICS, 1½ & 1¾—8 spindle, M.D.
GEAR HOBBERS, #3 Barber-Colman, M.D.
GEAR SHAPERS, #6 Fellows, M.D.
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72A Hydraulic, 2 M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
GRINDERS, Landis Hydraulic, 6"x18" M.D.
LATHES, Hendey, E.B.M. type, 14"x7' M.D.
LATHES, Hendey 16"x6' M.D.
LATHES, Hendey, 24"x10' G.H. M.D.
LATHES, Rockford, 16"x8' Geared Head, M.D.
LATHES, Turret Warner & Swasey #4 G.H., M.D.
LATHES, Lo-Swing 4"x36" Seneca Falls
MILLING MACHINES, Milwaukee #1B Universal #2, Plain, M.D.
NIBBLERS, Gray & Savage
PLANER, Gray 36"x36"x12' two rail Hds.
PLANER, Ohio 42"x42"x10' One Head, M.D.
PRESS, DDG54 Ferracute, D.A.
THREAD ROLLER, Watson-Flagg. Late type—3/16" to 2⅛" cap.

OTT MACHINERY SALES, INC.
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MDNA MEMBER

LOW PRICE MACHINERY for Maintenance and Small Shops

17" Acme Universal Turret Lathe, 4½" bar feed
#3 Garvin Duplex Miller.
#77A Gardner Double Disc Grinder, Motor driven
6"x72" Pratt & Whitney Thread Miller
12" Graham, knee type, Disc Grinder
#1½ B&S Plain Miller
#6 B&S 1½" Hand Screw Machine
#3 Brown & Sharpe Universal Grinder
6' Reed-Prentice Radial Drill
15"x15"x72" Norton Surface Grinder, motor driven
20"x27½' Engine lathe, takes 20' c-c
10"x72" Norton Plain cylindrical grinder
#1 & #2 B&S Universal Grinders
50 lb. Bradley Helve type trip Hammer
#5 Becker Vertical miller
#13 B&S Spur & bevel gear cutter
#5B Double acting, straight side power press.

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MEDIUM SPEED
DIAL TYPE
MILLING MACHINES
A.C. MOTOR DRIVE
NEW IN 1942

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Bridgeport 5 Conn.

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer
Cincinnati 36" x 36" x 16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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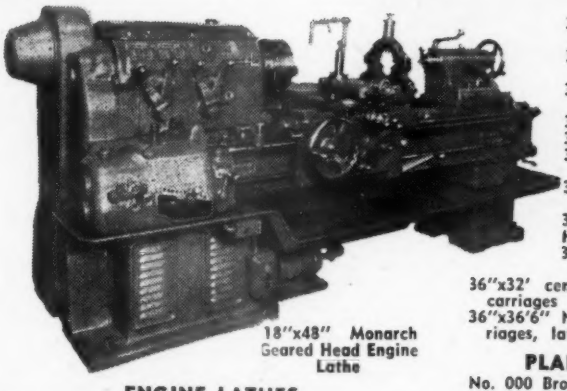


18"x48" Monarch Geared Head Engine Lathe

ENGINE LATHES

14"x6' American Geared Head, m.d.
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone, taper
14"x8' Pratt & Whitney, cone
16"x6' Bradford, cone, motorized, taper
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Geared Head, m.d., taper
16"x6' Sebastian Geared Head, m.d. in base, latest
16"x6' Lodge & Shipley Selective Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Patent Head, m.d.
18"x8' Lodge & Shipley, cone, motorized
20"x8' Springfield Geared Head, m.d., taper
23"x12' LeBlond Geared Head, m.d., taper
24" raised to 28"x10' Hendey Geared Head, m.d.
24"x10' American Geared Head, m.d.
24"x72" centers Lodge & Shipley Selec. Head, m.d., taper, latest
24"x10' Lodge & Shipley Selec. Head, m.d.
25"x10' LeBlond, cone
26"x14' Bridgeford, cone, taper, motorized
27"x16' LeBlond, cone, taper
30"x12'6" Niles-Bement-Pond Geared Head, m.d., taper
30"x13'6" Niles-Bement-Pond Geared Head, m.d.
30"x26' Lodge & Shipley Selective Head, m.d., 2 carriages
32"x16' Bridgeford Patent Head, m.d., taper
36"x10' Putnam, cone
36"x12' Wright, cone
36"x12' Lodge & Shipley Selec. Head, m.d.
36"x21' centers Putnam Geared Head, m.d.
36"x28'6" Niles Heavy Duty Geared Head, m.d., latest
36"x30' Lodge & Shipley Selective Head, m.d., 2 carriages
36"x32' centers Putnam Geared Head, m.d., 2 carriages
36"x36'6" Niles H.D. Geared Head, m.d., 2 carriages, latest

PLAIN MILLING MACHINES

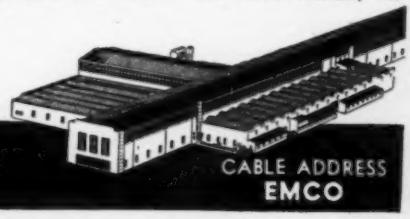
No. 000 Brown & Sharpe, m.d., latest
No. 1M Cincinnati, m.d.
No. 1A Milwaukee Mfg., m.d.
No. 1½ Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, latest type
No. 2 Cincinnati High Speed Dial Type, m.d. latest Type
No. 2MH Cincinnati, m.d., latest
No. 2 Cincinnati, cone
No. 2HL Milwaukee, m.d., latest
No. 3B Brown & Sharpe, m.d. in base, latest
No. 3B Brown & Sharpe, m.d.
No. 3S Cincinnati, m.d.
No. 4B Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Cincinnati Medium Speed Dial Type, m.d.
No. 4S Cincinnati, m.d.
No. 5B Heavy Brown & Sharpe, m.d.
No. 5 Cincinnati H.P., rect. overarm, latest
No. 5 Cincinnati H.P., rect. overarm, m.d.

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
24" Bullard Spiral Drive, m.d., with side head
36" Bullard New Era, m.d., with side head
42" Colburn H.D., m.d., 2 swivel heads
42" Bullard New Era, m.d., with side head
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
48" Putnam H.D., m.d., 2 swivel heads
52" King, m.d., 2 swivel heads
53" Niles, m.d., 2 swivel heads
54" Colburn, m.d., 1 turret, 1 swivel head
54" Bullard Spiral Drive, m.d., with side head, latest
72" Colburn, m.d., 2 swivel heads
84" Niles H.D., 2 swivel heads
100" Niles Heavy Pattern, m.d., 2 swivel heads

GEAR MACHINERY

No. 61A Fellows Gear Shapers, m.d., latest
Type A Barber-Colman Gear Hobber, m.d., latest
Type T Barber-Colman Gear Hobber, m.d., latest
No. 12 Barber-Colman Double Overarm Gear Hobber, m.d., latest
No. 3 Barber-Colman Precision Gear Hobber, m.d., latest
No. 34 Brown & Sharpe Gear Hobber, m.d.
No. 44 Brown & Sharpe Gear Hobber, m.d.
48" Cleveland Gear Hobber, m.d.
3" Gleason Straight Bevel Gear Generator, m.d.
8" Gleason Mfg. Type Straight Bevel Gear Generator, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical Gear Grinder, m.d.
11" Gleason Straight Tooth Bevel Gear Generator, belt
11" Gleason, m.d.
12" Gleason, m.d.
No. 13LS Fellows Gear Lapper, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 3-26" Brown & Sharpe Spur Gear Cutter, s.p.d.
No. 3-26" Cincinnati Spur Gear Cutter, s.p.d.
No. 4-36" Brown & Sharpe Spur Gear Cutter, s.p.d.
No. 6-60" Brown & Sharpe Spur Gear Cutter, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
Cincinnati Gear Burnisher, m.d. in column
No. 2HS Lees-Bradner Spur & Helical Gear Grinder, m.d.
No. 71A Fellows H.S. Gear Shaper, m.d.
Schuchardt & Schutte Gear Tooth Rounder, belt



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BRAKES—D&K 12'x⅜, leaf type
D&K, apron type, 8'x16 g, power

GRINDER—Centerless, Zephyr #2M (1945)

HAMMERS—Board Drop, Billings & Spencer, 1400 lb.
Board Drop, Billings & Spencer 1600 lb.

JIG BORER—Sip Swiss MP 3C—like new

LIFT TRUCK—Electric—2 ton—platform 38" x 54" with charger

LATHES—Engine LeBlonde 21" x 10' Q.C.
(2) Engine Monarchs 16" x 8' motor in base taper

POWER PRESSES

Air Hydraulics—2½ ton cap. New V&O #0—2/Bliss#18 Plain & geared—1/#19

Make	Tons	Die Space	Stroke	Shut	Type
Bliss #172A	22	5"x 4"	1½"	7"	End Wheel
Bliss #68C	35	21"x10½"	1-2½"	7"	Arch-DA
Adrianee #155	40	29"x36"	1½"	10"	OBI-SA
Torrington	40	23"x16"	1-2"	6¼"	SS-DA
Bliss #1B	43	14"x20"	3-6"	8½"	SS-DA, Gap
Hibbard	50	20"x25½"	2"	10"	OBI
(2) Bliss #52	40	13"x15"	3"	9½"	SS-SA
(3) Consolidated #54	56	17"x18"	3½"	12"	Trimmers-Shear
Bliss #4½	75	21"x26"	1½"-4½"	18"	SS-DA, Geared
(2) Bliss #7	180	28"x36"	1½"-4½"	15"	SS-DA, Geared Air Clutch
Toledo #39½S	500	31"x31"	8"	29"	SS-SA, twin drive
(3) Mystic #5A	40	14"x17"	6"	14"	Embossing & Moulding for Plastics

RIVET COUNTERSINKING MILL—Farnham 36" reach

ROLLS—Pyramid, open end, 8' x ¼"

SAWS—Kalamazoo metal cutting, New

SHEARS—Bliss 42" x 3/16" Squaring, power, gauges
Niagara 10" x 10 G, Squaring, power
Bliss 24" x 3/16, power, gages
Whitney Jensen 42" x 16" G, power, like new

(8) TURRETS—Denver 6" motor in base air chuck, late

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MDNA MEMBER

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IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 15 Hp motors and controls, forced feed lubrication. 21x27 bolster, 4½" stroke, 14½" shut height. In both Single and Double Action Models. Like new, no welds or no cracks. (15 available for immediate delivery.)

No. 6 BLISS, 90-125 Ton Capacity, straight side Punch Presses, late model. With scrap cutters, roll double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke, 16½" shut height. In both Single and Double action models. Like new. This machine is exactly like the above—only slightly larger model.

18—75 ton straight side punch presses adjustable strokes, late model, motorized.

SPOT WELDERS IMMEDIATE DELIVERY 5-100 KVA, Brand new. 5 year guarantee.

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BORING MILL, Hor. 4" Landis, Floor Type.
BOR. MILL, 36"-44" N-B-P, Tur. & Side Hds.
BOR. MILL, 42" King, Tur. & Side Hds.
BOR. MILL, 60" N-B-P, 2 heads, M.D.
BROACH, Hr. Hyd. XA Oilgear, 60" stroke.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILLS, Radial, Hyd. 4' Fosdick, Economax.
GRINDER, Centerless, No. 2 Cincinnati.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton, M.D.
GRINDER, Rot. Surf., No. 25 Heald, M.D.
GRINDER, Surf., No. 2 Diamond, 16x36.
GRINDER, Surf. No. 16 Blanchard, M.D.
HAMMER, Board Drop, 1,000#, B & S.
HAMMERS, Steam Drop, 5,000#, & 12,000#.
JIG BORER, N. 2 Pratt & Whitney, M.D.
LATHE, 24"x16' American, Grd. Hd., Q.C.G., T.A.
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd., Q.C.G., T.A.
LATHE, Turret 6W Acme, 3" h.s., Mtr. in base.
LAPPER, No. 1 Micromatic Hone (New)
MILLER, Duplex 24" Cincinnati Auto.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MILLER, Univ. No. 1½ K & T, No. 3A B & S.
PIPE MACHINE, Landis, Cap. 1"-6".
SHAPERS, 24" Cincinnati, 28" G & E.
SHAPER, Vert. 10" Pratt & Whitney.
WELDER, Spot, 50 KVA Federal, P1-24A (New).

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28th St. & A.V.R.R., Pittsburgh, Pa.

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Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drill, 21" Boyersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindle
Drill, #25 Foot-Burt, motor driven
Drills—New— 18" Royal Motor driven (10)
Gear cutter, Brown & Sharpe #2—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks, #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathes, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

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"Excellent Condition"

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Boring Mills, 36"-42"-52"-72"-96"
Bolt Cutters, 1"-1½"-2"-2½" Acme Landis
Lathe, Turret 3-A W. & S. S.P.D.
Millers, Plain No. 3 K & T. No. 4 Cin.
Press, Forging 1000 Ton United St. Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36"
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9" Bar BETTS Horizontal floor type, 50" face plate, 8'—vertical travel, modern, 4-motors.

3" & 4½" Bar Universal TRI-WAY Horizontal Boring Mill, P.R.T.
No. 32 LUCAS 3¾" Bar, M.D.
No. 35 LANDIS Horizontal floor type
52" KING Two Swivel Heads, All-Geared.
96" CINCINNATI, 2 swivel heads.
100" N.B.P. Vertical 2-swiveling heads
12' BETTS Heavy, Double Drive.
14-20' N.B.P. Extension type boring—2 swivel heads, all geared feeds
No. 1 PUTNAM car wheel Borer.

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24"x24"x16' INGERSOLL Planer type.
#4-B B & S Double overarm.
Nos. 2 and 4 CINCINNATI High Power Vertical, Power rapid traverse.
No. 5 CINCINNATI Plain Rectangular overarm table 83"x21".
No. 3-36 CINCINNATI Duplex Hydromatic
6"x14" PRATT & WHITNEY, thread.

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30"x14' AMERICAN, 12 speed, G.H.
36"x24' N.B.P. "Timesaver".
PUTNAM Double Axle Lathe, G.H.
30"x34' LEBLOND Gun Boring.
42" PUTNAM Car Wheel Lathe, G.H.
48"x70' N.B.P. Engine Lathe.
48"x30' SIMMONS, Geared head.
60"x30' Centers N.B.P. Heavy Duty Geared Head, M.D. (Built 1942).
60"x40' Centers MACKINTOSH-HEMPHILL Heavy Duty Geared Head M.D. (Built 1942).
79" N.B.P. loco, driving wheel lathe.
90" PUTNAM Driving Wheel Lathe with journal truing and Double Quartering
No. 2-H LIBBY, Full Universal Cross Feeding Turret, Taper Attachment, M.D.

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8' AMERICAN Triple Purpose Radial.
No. 310 BAKER, high speed.
No. 314 BAKER, high speed.

GRINDERS

No. 2 CINCINNATI centerless grinder.
24"x20' Centers NORTON Plain. Cylindrical individual motor drive to work spindle, wheel spindle and table.
No. 70 HEALD Internal.

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No. 5 Pfauter, spur, helical and worm, 130" dia. capacity.

100" GOULD-EBERHARDT, Horizontal, for spur, helical and worm gears, capacity diameter 101" face 48".

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48"x48"x32' GRAY Spiral Drive, four heads, 230 volts, D. C.
72"x72"x15' N.B.P. 4 Hds, 230-volt.

14'x9'x35' Capacity Detrick & Harvey Convertible openside, 2 rail heads, 2 side heads, traveling outer support, 230 V.D.C.

60"x60"x18' CLEVELAND Openside.
84"x60"x18' DETRICK-HARVEY Convertible Openside, 230-volt, D.C.
120"x96"x20' CINCINNATI Rapid Traverse, 230 volt, D.C. reversing type planer motor and control, 4 heads.

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15" BETTS Heavy Slotter.
18" NILES-BEMENT-POND Heavy Slotter.
21" NILES-BEMENT-POND Slotter, M.D.
36" MORTON Drawcut, Rotating Arbor, Geared Feeds, P.R.T., M.D.

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1½"x1½" CLEVELAND Punch, 42" Throat
30"x⅞" N-B-P Bending Rolls
No. 2 PRATT & WHITNEY Jig Borer with 22"x44" table.
60" NEWTON Cold Saw, M.D.
No. 55 NEWARK Spur Gear Cutter.
60" CINCINNATI Spur Gear Cutter.

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21" stroke—Strokes per min.—25
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32" Cincinnati Bickford, Sliding Head
6' American, Radial
4' Fosdick, Radial

GRINDERS

#2 Reid, Surface
#33 Abrasive, Surface
Model B Thompson, Hydraulic, 12"x24" Surface
#2 Cincinnati Centerless

LATHES

14"x6' LeBlond Geared Head
15"x6' Sidney
16"x6' Porter-McLeod, Geared Head
16"x7' Lehman Hydratrol, Geared Head
17"x6' LeBlond, Taper Attachment
19"x8' Sidney
26"x12' Flather
36"x16' Bickford, Geared Head

MILLERS

#2 S.P. Van Norman, Plain
#2 Cincinnati, Vertical, Dial Type
#3 Cincinnati, Plain, High Speed, Dial Type
#4 Cincinnati, Universal

TURRETS

#5 Gisholt Universal
#3B Foster Universal
#2A Warner & Swasey
#4 Warner & Swasey

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24" x 72" American "New Type T" Engine Lathe
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#2SP Van Norman Plain Miller
#2KM Kearney & Trecker Vertical Miller
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6-spdl. 7½" Goss & DeLeeuw Chucking Machine
3'-11" Carlton Radial Drill
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8"x108" Fitchburg Lo-Swing
12"x18" Lipe Carbo
18"x6' American Grd. Hd.
20"x10' Lodge & Shipley Grd. Hd.
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head

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No. 2H Milwaukee Vertical, latest type
#3 Milwaukee Vert. M.D.
#3K Milwaukee Vert.
No. 4 Cincinnati Plain, Motor Drive
No. 4K Milwaukee Plain Late Type
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
Pratt & Whitney Spline
No. 27MB Smalley General Thread
#2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread
26"x25"x12' Ingersoll Adjustable Rail
42"x36"x14' Ingersoll Adjustable Rail, four heads

DRILLS

No. 2-8 Spdl. Leland-Gifford
7' American full Universal Radial

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34" King, s.p.d
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72" Colburn, Motor Drive
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No. 1A Warner & Swasey Turret, Timken (3) 1941
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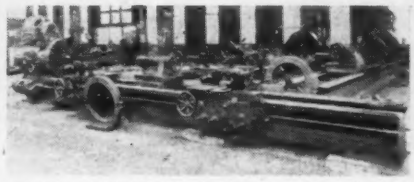

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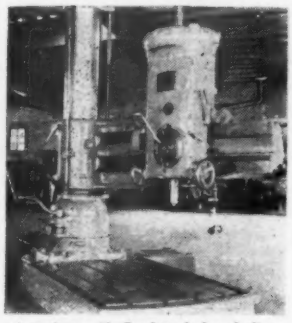

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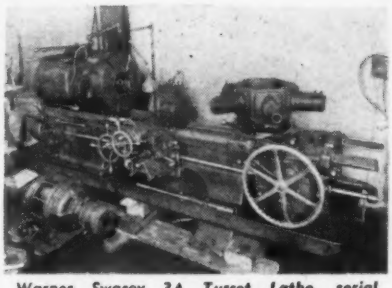

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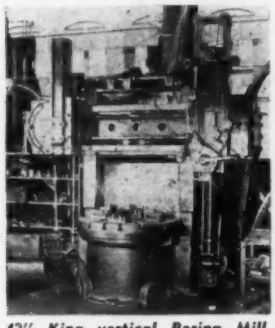

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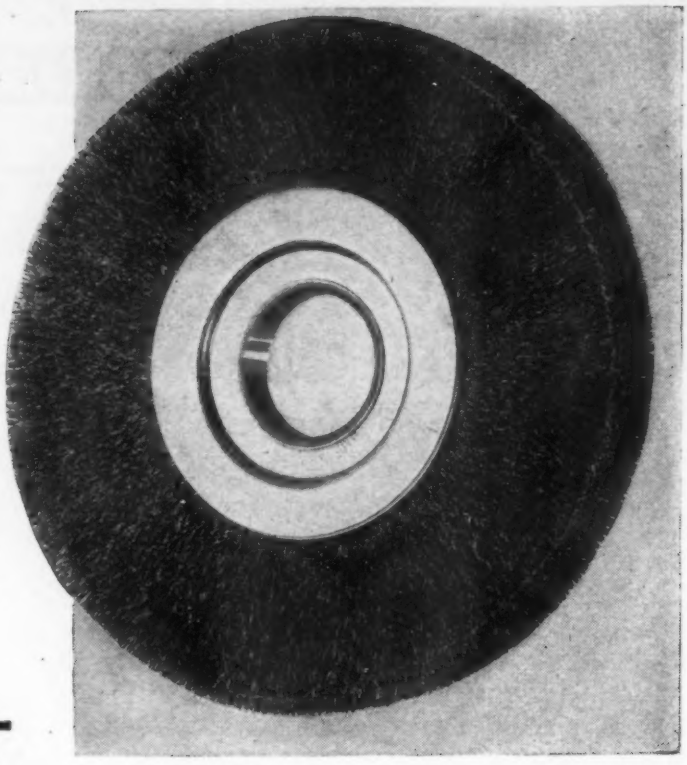

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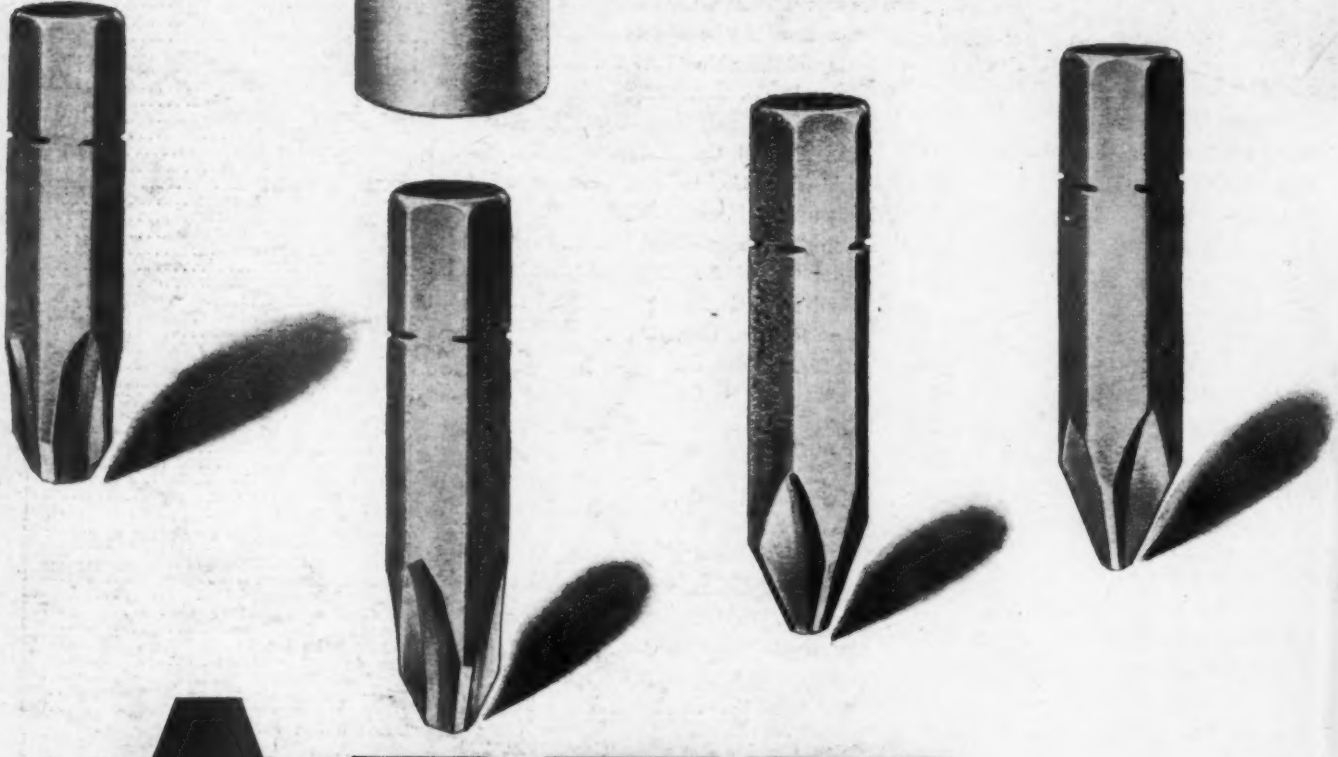
How to make 1=4

One Apex bit holder makes up to four Phillips screw drivers with the simple addition of Apex money-saving insert bits. One range of inserts (four Phillips point sizes) fits various holders, simplifies your inventory, saves returning bits for reconditioning. You obtain the desired holders, then simply stock inserts for replacement needs.

Bits float in holders, allow easier alignment with screw recesses, wear longer. Holders furnished for practically all makes of power, spiral and hand drivers. Bulletin 102 gives you all the facts. Write for it.

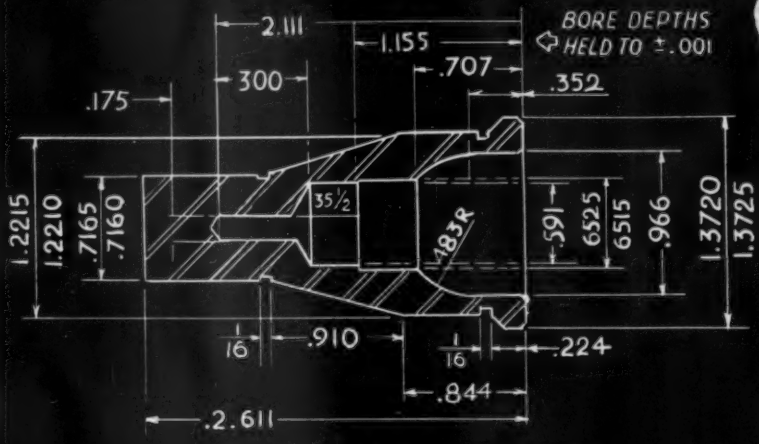


APEX INSERT TYPE BITS

THE APEX MACHINE & TOOL CO. • DAYTON 2, OHIO

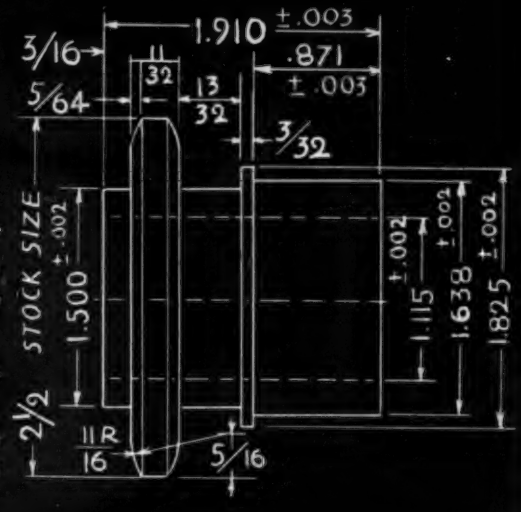
CYLINDER AIR CHAMBER

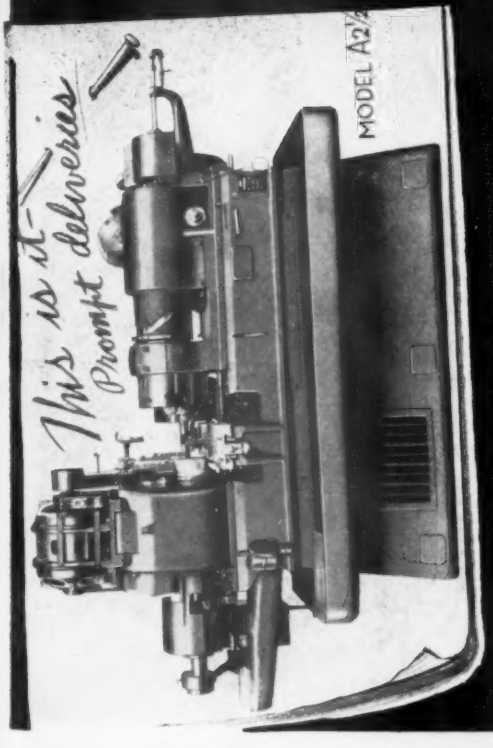
1. Gauge from rear slide Drill ⅞" dia. ½" deep at 352 R.P.M.
2. Drill 37/64" dia. 1.456" deep. Form outside dia. complete and face at 316 R.P.M.
3. Drill 11/64" dia. 2.112" deep at 1502 R.P.M.
4. Counterbore .956" and .642" dias., and Skive outside dia. after counterbore at 316 R.P.M.
5. Finish ream all diameters. Cut off at 352 R.P.M.



TRANSMISSION SPROCKET

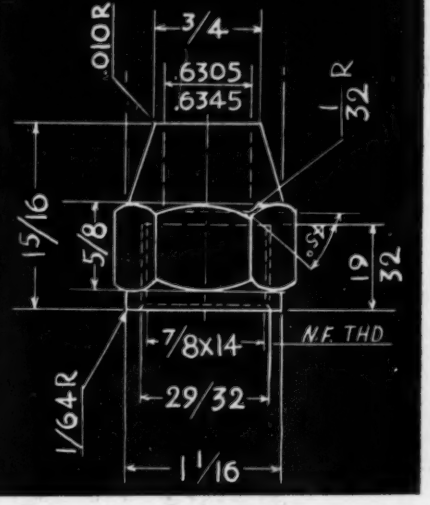
1. Gauge. 2. Spot for drill at 395 R.P.M.
3. Drill 1 3/32" dia. hole. Face end, form 1.638" dia. and 1.825" dia. with front slide. Form 1.500" dias., both faces of tooth form and breakdown for cutoff to 1.500" dia. with rear slide at 231 R.P.M.
4. Ream hole to 1.115" dia. at 395 R.P.M.
5. Cutoff with independent cutoff attachment at 395 R.P.M.





COUPLING

1. Gauge.
2. Drill for tap (use .807 dia. drill with 45° point) at 1010 R.P.M.
3. Drill rest of way through with 3¾4 drill at 1010 R.P.M.
4. Tap ⅞—14 pitch thread at 198 R.P.M.
5. C'Bore .630 dia. and chamfer I.D. on front of piece. Cutoff on return stroke at 1010 R.P.M.



Joe, Please NOTE! a Cleveland Automatic "(Model A2½") cuts costs on Jobs like these

THE CLEVELAND AUTOMATIC MACHINE COMPANY

2261 ASHLAND ROAD • • CLEVELAND 3, OHIO

CHICAGO (6) 1408A Civic Opera Bldg. CINCINNATI (12) 4932A Beech St. DETROIT (2) 540A New Center Bldg.
HARTFORD (1) 529A Capital National Bank Bldg. NEW YORK (6) 2402A Singer Bldg.

Hones big diesel engine cylinder liners *in five minutes*

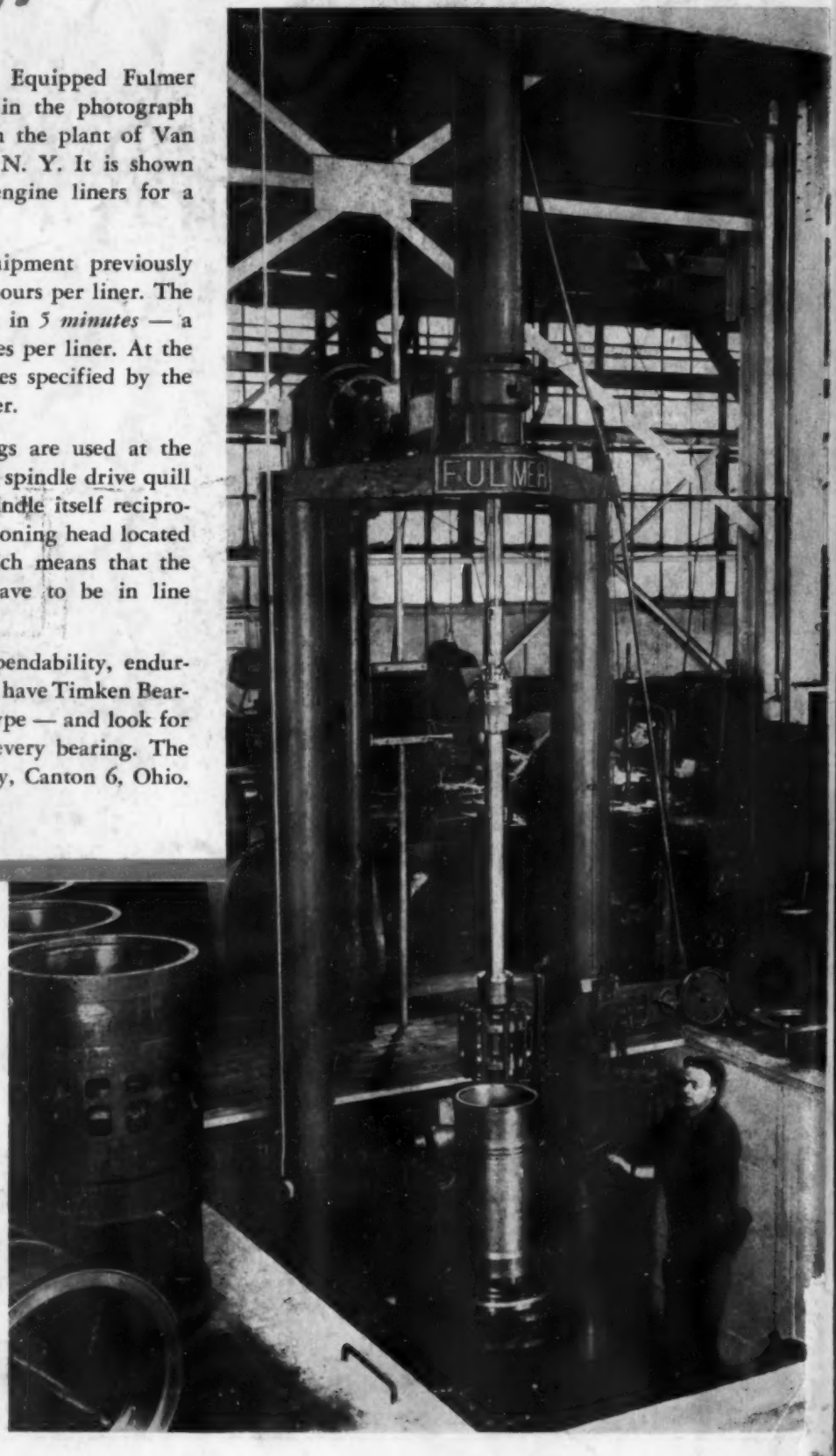
The Timken Bearing Equipped Fulmer Model 20/72 Honing Machine in the photograph is one of a battery operating in the plant of Van Der Horst Corporation, Olean, N. Y. It is shown honing chrome plated Diesel engine liners for a large locomotive builder.

With the type of honing equipment previously used, this operation required 2 hours per liner. The Fulmer Honing Machine does it in *5 minutes* — a clear saving of 1 hour 55 minutes per liner. At the same time the exacting tolerances specified by the user are maintained to the letter.

Timken Tapered Roller Bearings are used at the upper and lower positions of the spindle drive quill and on the pinion shaft. The spindle itself reciprocates through the quill and the honing head located below two universal joints, which means that the center of the liner does not have to be in line with the spindle proper.

For the utmost in accuracy, dependability, endurance, and economy make sure you have Timken Bearings in your equipment — any type — and look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN BEARING EQUIPPED



PHOTOGRAPH COURTESY VAN DER HORST CORPORATION.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

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